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# THE GEOGRAPHICAL JOURNAL

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# The Geographical Journal

Vol. LXVIII No. 2 August 1926

## ADDRESS AT THE ANNIVERSARY GENERAL MEETING, 21 June 1926

Dr. D. G. Hogarth, C.M.G., President

ONE short year's experience as President gives me small authority to speak *ex cathedra;* but from more than thirty years' unofficial knowledge of the Society, I have no hesitation in saying that it is in very sound health. Its membership is more numerous than at any previous period of a history which is within four years of its Centenary; its activities are more comprehensive and more various; its possessions are greater; and among the accessions of this year, or indeed of many a year past, stands pre-eminent that gift of rare books by Mr. A. P. H. Hotz, of which while still incomplete my predecessor spoke last year. We enjoy both in this country and abroad a higher prestige; we obtain both for our meetings, whether pre- or post-prandial, and for our *Journal*, communications of an interest and a value superior, on the whole, to its standards of the past, though these have been sufficiently high to earn us first place among the geographical societies of the world.

For its prosperity the Society has to thank many generations of officers and officials, and none more than its actual Secretary, Librarian, and Map-Curator. Few more also than its late President. Lord Ronaldshay brought to its Chair the prestige and experience of a Proconsul distinguished among proconsuls. The Council has never, within my experience, been handled at once so firmly and so kindly as by him, and I have served under no Chairman who showed a surer instinct for the essential, and so expeditious and at the same time thorough conduct of business. His oratorical gift distinguished our meetings and his study of his briefs has set an example to his successors. Comparison of his parts and experience with those of the famous ex-President who passed away some fifteen months ago inevitably suggests itself; but I will leave some future Plutarch to elaborate it. Enough to say that Lord Ronaldshay, not less than Lord Curzon, put exceptional powers trained in an exacting school and long experience acquired in high affairs unsparingly at your service.

We have reason to be self-gratulatory; but "lest we forget," I will make two reservations by way of chastening enthusiasm. First regarding

the Society's financial position. Unless you are unlike the Fellows of other Learned Societies of which I have knowledge, few of you will retain, after perusal of our annual statement of accounts, much beyond the pleasant fact that our gross income has grown to over £21,000 a year. No remark falls more often upon my ears than that, "of course, the Royal Geographical is a rich Society." So it is, as Learned Societies go. But it is equally true that its establishment, organization, and scope of activities demand inevitable expenditure on a higher scale than falls to be met by almost any of its sister Societies; and I shall not, I think, be wasting either your time or mine if, in order to justify that last statement, I draw a few deductions from the Statement of Accounts which is now in your hands. For fear of trenching on the Treasurer's province, I will not repeat his figures, which, moreover, are before you; but, in regard to one or two items of expenditure, I will combine what is distributed under different heads.

How did last year's income go? Deducting returns on Publications and Instruction, I will reckon it at a total of £19,000. Over half of this went, in fact, upon maintaining and gradually improving our large house and paying the salaries and wages of a staff of twenty-seven persons plus a few pensions. The salaries, etc., make by far the heavier item, amounting to about £9900, or a little over 50 per cent of the income. In regard to the House, which, apart from wages, cost us about 6½ per cent. of that income, I need only remind you that it was built in less expensive days on a rather sumptuous plan with large basement rooms not designed for the purposes for which we require them, and needing, therefore, adaptation and refitting. This work is being carried out piecemeal year by year, but even now is not quite complete. In regard to the Staff, I can only say that, large as it seems for a Learned Society to be maintaining, it is not large enough to meet every call made upon us; and I have satisfied myself both that every member of it is in full necessary work and that none is overpaid. You should bear in mind, together with the size and character of our house, the actual range of our activities; the volume and importance of our Library and our collections of maps, photographs, etc.; the necessity of maintaining in full efficiency a cartographic department and a school of scientific instruction; and the large membership of the Society, which entails heavy secretarial work.

One of our most essential activities is publishing. When all returns by sales, etc., are allowed for, a contribution of about 25 per cent. of our gross revenue had to be made under this head. The remainder of last year's income not yet accounted for—roughly 18 per cent.—went, as to about 4 per cent., on office expenses, and as to a slightly higher percentage, on meeting the needs of the Library and the Map and Photograph Collections in purchases, binding, and mounting. This last percentage will be agreed, I think, to be all too small. Consider-

ing our position and prestige we can ill afford economy under such heads. Expenses of meetings—about 3 per cent.—needs of the School of Instruction, especially in the matter of instruments, delegations sent to festivals of sister societies abroad or (as last year) to take over gifts, and other minor items in the Balance Sheet—these together account for nearly all the 10 per cent. remaining; and, as you may find by addition and subtraction of the figures before you, we had a balance of just over £100. This, supplemented by an expenditure of some £400 on instruments lent to explorers, and of something less than £100 in excess of our income, went to financing expeditions. That is to say, that in the past year, as in the year before, we had nothing like the four-figure balance to devote to exploration that we used to have before the War. Yet even last year's expenditure under that head was the highest that we have been able to afford since 1914.

This is not, I think you will agree, the position in which the first Geographical Society in the world ought to stand to-day. Yet, though our income steadily rises, we cannot hope to recover our pre-war freedom for some years to come. Our other expenditure, so far as I can see, is either irreducible, or at best reducible, with some loss of efficiency, only to an extent which would make but a negligible improvement of our capacity to finance discovery. What we want, therefore, more than anything else, is an Exploration Fund, accumulated by gifts earmarked for that and that alone; and, may I add, by bequests? I venture to appeal to our thousands of Fellows to remember the Society more frequently and more considerably when they come to make testamentary dispositions. It is not an irksome mode of giving, and it is a fruitful one—because, if for no other reason, legacies to a Society, which benefits under the Charities Act, lose less in transfer than other bequests. Till such an appeal as I hereby make has been answered, our prosperity will be neither so great nor so well-assured as it may appear at first sight, and our self-gratulations must be subject to discount.

The second reason for deprecatory comment I find in a matter which is affected to some extent by that same financial weakness. The supply of good papers and readers for our evening meetings is not what it used to be. I said a few minutes ago that we had filled last year's bill with lectures fully up to our highest standard. That is so. But at what cost of the Secretary's time and energy! and with how little at any time in reserve! Before the War, if a lecturer should cry off, half a dozen would be ready to take his place, each having some tale of good pioneer work to tell. Now they must be sought out and coaxed on to the platform. Are there, indeed, much fewer explorers at work now than of old? Probably; for the world, at least the Old World, is poorer, and expeditions have become correspondingly costlier to equip and carry through. Many who could once have afforded the money and the time will do so no longer. In these circumstances how valuable would be an Explora-

tion Fund in our hands, enabling us not only to finance expeditions, but to direct them whither they should go!

There are other reasons, too, that help to account for some scarcity of explorers. A general impression is abroad that no big things in scientific exploration remain to be done. Untrodden snows about the Poles, untrodden sands in South Arabia, or Central Asia, or Central Australia, there remain yet, but scarcely anywhere else a more promising virgin tract, so extensive and so ill reported that it may still spring a surprise of the first order. At the same time, between the route-lines of the pioneers, much still remains unseen and unrecorded. In many parts of four continents at least our maps still recall Admiralty charts—so precise in their delineation of one thin line, so vague about what lies behind it. Search any honest atlas for dotted rivers and estimate the total area of the globe that they drain. You will be surprised. During no more than this last session of our Society, we have been introduced to tracts and peoples seen for the first time by white men in South America, in Western China, in Abyssinia, and even on the border-line between two British possessions, Assam and Burma. There is enough and to spare still to be done by the traveller of varied parts and interests, or by parties of various specialists, more especially if progress be leisurely and if surveys take in a wide lateral range and be intensive. Few can hope to devote the time or find the funds to emulate Dr. Hamilton Rice's lifelong enterprise of exploring the Amazon basin; but any one could find some smaller and less difficult area equally ill known and return, with all sorts of experience and a reputation made, to thrill one of our evening meetings with a tale of things seen. But it is almost idle to suggest such tasks unless you can make them possible, that is to say, unless you control the necessary funds. This Society has the necessary knowledge to stimulate further adventuring, but it has not that command of means which would justify its approaching the adventurer with a view to his undertaking any of the particular explorations that it knows await the right man.

Secondly, as a result partly of that supposed dearth of big objects, partly too of a new means of distant travel—the aerial vehicle—but most because of the ever-present appetite for the sensational, which, with rare exceptions, the press of the world finds it profitable to feed, the interest and the means available for promoting exploration are being diverted from really scientific objects to what may be called "stunts." Each dash by air to the Pole probably absorbs the interest, energies, and funds sufficient to furnish forth a dozen expeditions which would bring a hundred times more copious and valuable returns to geographical science. Mind you, it is simply on this ground and from the point of view of one interested in geographical exploration that I deprecate those aerial ventures. From other points of view, that, for example, of the development of aerial navigation, or that of learning the human capacity

of endurance, I recognize their potential utility, and I concede that, indirectly, the experience that they add to the sum of human knowledge must be of advantage to exploration. Nor do I wish to imply any doubt of the great service which aircraft are capable of rendering to exploration. No one who heard Dr. Hamilton Rice's lecture will question their value as auxiliaries. But, as things are at present, the contribution which an airship or an aeroplane, if it acts otherwise than in combination with a ground party, can make to geographical science, is unlikely to bear any reasonable proportion to what must be expended on sending it forth. I had some experience in the War of the comparative futility of the survey of unmapped regions from the air; and if the airman cannot be relied on to detect an up slope from a down slope, he certainly cannot be expected to learn unaided much else about the ground below him. A famous explorer (not British) came to me in 1917 with a proposition to fly from Aden across that *terra incognita*, the South Arabian desert. I could only reply, that if he really wished it I would do my best to induce the Aden authorities to help; but when I put it to him whether, from any height at which it would be safe to fly over superheated sands, he expected to discern details of relief or other surface features with sufficient certainty to make a map which would be much better than the present blank, he admitted that he did not. What he expected was to achieve a "stunt" rather than a geographical exploration. Well, a "stunt," unfortunately, appeals to a hundred minds, while a scientific geographical expedition appeals to one. Therefore the latter, if it is not to suffer by the competition of the former, needs the protection which this Society ought to be the first to give. But, in our present position, we can but ill compete with the inducements that popular enthusiasm for stunts and records will offer.

I am not saying, however, that we do little to further exploration, still less that there is no prospect of our ordinary funds ever being better able to promote it. But our ordinary expenditure will certainly rise as well as our income, if, as we hope, not quite so fast. In the past year we have contributed subscriptions, as the Statement of Accounts informs you, to three exploring parties, one of which, the mixed expedition which assailed and conquered Mount Logan, did as fine a piece of work, both in organization and in performance, as stands to the credit of any one. I beg in particular to call attention to the remarkable preliminary achievement of Mr. MacCarthy in laying out a chain of supply posts by methods whose boldness or precision one does not know whether most to admire. Furthermore, to several more expeditions we have contributed instruments, notably to one now in progress, that of Major Mason in the high Himalaya, about which we hope to hear great things before long. Thanks largely to Mr. Hinks, we have been able, by expenditure of some hundreds of pounds, to put at Major Mason's disposal an instrument not used hitherto in India and capable of doing survey work of a

range and a precision not previously attained. The ample resources of which Dr. Hamilton Rice disposes render him independent of any contribution from us towards his strenuous and methodical exploration of Amazonian tributaries; but he is not independent of our encouragement and our good report, and, as before, he has made the first comprehensive communication of his results to this Society. So far, too, as the English-speaking world is concerned, those bold pioneers and most expert photographers, Dr. and Madame Visser, whose revelation of giant glaciers thrilled you early in the session, reserved the statement of their results for us. May I remind you also of the very notable accounts of important journeys which Dr. Knud Rasmussen and Dr. Gordon Thompson communicated to evening meetings? And last, but not least, of the fascinating lecture by that most human of naturalists, Dr. Chapman of the New York Museum? There are other important explorations either already afoot or about to be organized, of which we expect to hear next session. I only ask that we may be in a position to promote more. We are quite prepared to deal with an embarrassment of riches, and we are ready, if the means are put in our hands, to direct the aims and energies of explorers to plenty of dark patches on the yet unexhausted globe.

It falls to my lot, as it did to that of my predecessor, to record and deplore the death of a notable ex-President. Sir George Taubman Goldie, though he was the maker of one of the most important fractions of our Empire, was much less of a public figure than Lord Curzon. Nothing in his strenuous earnest character was more conspicuous than his dislike of any sort of notoriety or even publicity. He was a man of many actions and few words. When his mind was made up to achieve, he turned neither to right nor left till the thing was done. Then he loved to hand his finished product over to some one else, and himself slip out of sight. He was a forcible but kindly President of this Society, who made its interests his own and was ever on the look-out for means to improve its position. One of his constant aims was to promote interchange of opinion among members of the Council at less formal and more sociable meetings than a Council Board allows, and to bring other Fellows into touch with the Council and with each other—a laudable aim for any President to set before him, and especially so for a man so naturally shy and retiring. After his Presidential term was over, he served for a dozen years as Foreign Secretary, and till he left London for the country, whence he was soon compelled to depart to warmer climates each winter, he rarely missed a Council meeting. My senior by half a generation, he inspired in me not only respect, but affection; for few men could put a junior more at his ease or convince him more successfully that he was appreciated. I followed him to his grave not only as the Founder of Nigeria, nor only as a former President of this Society, but also as a friend of many years' standing.

Would I were in a position to say, in my first year of office, that our

garden was sold and that the construction of the long-desired Hall would be begun without further delay! Unfortunately, the latter project depends entirely on the realization of the former, and this is not yet achieved, though a while ago a long, intricate, and promising negotiation, initiated by my predecessor, seemed likely to have been brought before this to a favourable conclusion. Delays and disappointments in regard to that land have been many in these dozen years or more that we have owned it, partly because the Council has always insisted on certain special conditions framed with a view to preserving the amenity of your fine Kensington property. Under those conditions the land which we offer could not be every one's choice. But we have reason now to hope that the period of suspense is almost over.

In conclusion, I will sum up the year's record as one of full activity in all the functions which legitimately fall to this Society to perform, and of maintenance and steady improvement of the prosperity which has returned to us since the War. Hardly any other Learned Society has recovered so quickly and so fully; in token whereof we have removed, I am glad to say, all disabilities from our foreign members who were suspended during the War. But it has also been a year of peculiar difficulties for the permanent staff—difficulties due in part to causes which have affected, and still in great measure affect, every one in this country. Your sympathy and consideration are due especially to Mr. Hinks and Mr. Reeves, who have both gone through periods of illness at busy periods of the session. Both returned to work at the earliest possible moments—perhaps at earlier moments than they should in prudence have chosen. Recent and not altogether past conditions of transport have made life none too easy for the rest of the staff, and in particular have tended to throw an even greater burden of responsibility than usual on the Secretary, who has not been able to obtain as much help as in ordinary times from the President and the Honorary Secretaries, all, as it happens, non-resident. The withdrawal to permanent country residence which has come to be more and more a feature of society since the War, obviously must add a very serious difficulty to those besetting the conduct of London Societies in days of strikes and restricted facilities of transport. Fortunately, it matters far less that the President and the Honorary Secretaries should be hampered in the discharge of their duties than that the Permanent Secretary should be so. There are some occasions when a President is indispensable; there are more when he is a desirable element in proceedings. But there are no occasions when the presence of the Secretary is anything less than absolutely essential.

# THE GEOGRAPHY OF THE MOSUL BOUNDARY

Major H. I. Lloyd

*Read at the Meeting of the Society*, 8 *March* 1926. *Folding map follows p.* 192.

**INTRODUCTION.**—In the course of official duties I have visited most parts of the Mosul area, and if geography includes general political, ethnical, and economic considerations, I may be able to justify the title of this paper.

The preliminary difficulty in its consideration is the definition of the term " Mosul." At the armistice in 1918 the British forces had advanced to a point north of Sharqat, which lies 60 miles south of Mosul; but a condition of the Armistice was that the Turks should evacuate all Mesopotamia, defined as the area contained in the three Turkish vilayats of Basra, Baghdad, and Mosul. From this time onwards the British Government regarded as settled the future of these three Turkish provinces, and when it set up the new Kingdom of 'Iraq in 1921, no doubt ever occurred that the whole of the area comprised in these three Turkish provinces would form part of the 'Iraq State, but as no final treaty had been concluded with Turkey the frontier remained undefined. Administrative considerations had, as a matter of fact, made it desirable to enlarge the frontiers of 'Iraq so as to take in the Hakkiari country, then deserted, but which had formerly been the home of those Nestorian Christians who form the most reliable of the native levies of the country. In fact, a number of these Assyrians had been settled unofficially in some of their old homes on both banks of the Zab River between Amadia and Julamerk, where they remained until expelled by the Turks in September 1924.

At the Lausanne Conference a new and vigorous Turkey endeavoured, with success, to raise the whole question of the armistice settlement, and claimed that the whole province of Mosul should be restored to her. As will be seen from the map, and as is in fact well known to all who have travelled in that area, the province of Mosul is an integral part of 'Iraq, and its southern boundaries come very close to Baghdad itself. The problem of the 'Iraq boundary was regarded from different points of view by the British and Turkish Governments. The Turkish Government declared that the whole of the Mosul province was Turkish in blood and sentiment, and if not Turkish was at any rate not Arab. They declared that they would be satisfied with nothing less than the retrocession of the whole of the Mosul vilayat. The British Government regarded the function of the treaty to be the finding of a frontier between 'Iraq and Turkey. The Mosul vilayat, they claimed, was naturally, economically, and ethnographically part of 'Iraq. The question, as they visualized it, was, along what mountain range or river valleys can the most suitable defensive frontier be drawn; and how can the Nestorian Assyrians be enabled to reoccupy the homes which they had held for 2000 years until

driven out in the course of the Great War? This problem the Conference at Lausanne decided to refer to the Council of the League of Nations for decision, should Great Britain and Turkey fail to have arrived at a decision within nine months of the ratification of the treaty at Lausanne. When Sir Percy Cox at Constantinople explained the British claim, the Turkish Government reiterated its demand for the whole of the Mosul province, and the conference broke down. Within a month the Turks invaded 'Iraq territory and expelled the remnant of the Nestorians who were occupying the Upper and Lower Tiari country. The dispute was referred to the Council of the League, who appointed a sub-Commission under the late Mr. Branting, who at Brussels in October 1924 laid down the *status quo* line. This line has been called the Brussels or Branting line. It followed with minor modifications the old boundary of the Mosul vilayat. In the latest Award of the Council of the League this Brussels line has been declared to be the northern frontier of 'Iraq.* It is not the best frontier; the line claimed by H.M. Government at Constantinople in 1924 and at Geneva in September 1925 is undoubtedly an ideal frontier consisting of ranges of high, almost impassable mountains. It would serve as a good defensive frontier for the weak Kingdom of 'Iraq, and would make for ease in administration, as the barrenness and difficulty of these mountain masses would effectually deter tribes on either side of the frontier from raiding across the line.

This area between the Khabur River and the Persian frontier is a mountain mass with summits over 10,000 feet high. The Great Zab cuts its path through it forming gorges with perpendicular sides, sometimes 5000 feet deep. Between the Khabur and the Zab the mountain chains run generally from west to east; beyond the Zab the direction of the mountain chain is no longer clear until the summit of Jelu is reached, whence the mountains definitely run from north-west to south-east. This mountain system is crossed by very few passes. Between Geramus and Deria-i-Zir Pass there is only one path, which the nomad Artoshis use when going up with their sheep to the summer pastures in the northern mountains; another road leads from Ashuta along the Lizan valley to the gorge of the Zab, and thence northwards to Lewin and Julamerk. This road is not much followed even by the nomads. The communication is only used between local villages; it is not a main highway. Another similar track followed by a section of the Artoshi nomads runs through the mountains of the Lower Tiari and Tkhuma to the east of the Zab and the district south of Julamerk. All the other roads are nothing more than mountain tracks used for local communication. To the east of the rivers Oramar, Rudbar-i-Shin, and Shemsdinan

* The "Brussels line," with one slight modification, has been adopted in the Treaty concluded between the United Kingdom and 'Iraq and Turkey in June 1926, but not yet ratified. The modification leaves the road between Alamun and Ashuta in Turkish territory.

are confused mountain chains running back to the great wall formed by the summits of Jelu, Ser-i-Sati (Sat Dagh), and Chahr Chelli. No nomad route traverses this sector, and the few existing tracks pass through so wild and steep a country that they could not be used for the passage of flocks of sheep. From the Shemsdinan river to the Persian frontier is a mountainous region practically deserted, crossed by two roads only—one leading from Kani Rash through the Zini-a-Berdi pass to Neri; and the other from Ruwandiz into Persia through the Gadir Pass, which touches the extreme eastern portion of the section. This is the frontier proposed by the British Government in the north-east of the disputed area; the frontier westward has never been in dispute.

**The Western Boundary.**—Between the Khabur and the Hazil, a small stream which could only serve as a conventional frontier, the country is mountainous and broken, but not impenetrable. West of the Hazil lie the low foothills of Faishkhabur, and beyond stretch the plains of the Northern Jazira. From Faishkhabur westward 'Iraq in theory is bounded by French Syria. The frontier follows the Tigris from its junction with the Khabur along the left bank until it reaches the Wadi Suwaidiya. The frontier follows this wadi until it reaches Tel Rumailan. The maps in this region were extremely inaccurate. The territory to the north of this line is part of Syria; therefore it is technically not Turkish; as a matter of fact, latterly it has been occupied by the Turks, but it is entirely deserted except for the nomad Shammar and other 'Iraqi tribes in spring and summer. South-west of Tel Rumailan is the Jabal Sinjar, where the Yezidi (Devil Worshippers) live. This area has belonged to either Baghdad or Mosul vilayat since the Turkish conquest, and as such was occupied by British forces after the armistice. In fixing a provisional boundary-line with the French it was decided to accept a line from Abu Kamal to Tel Rumailan. On the maps in use at the time such a line gave the whole of the Jabal Sinjar as far as Al Bidi and Khatuniya to 'Iraq. It is doubtful whether the new maps are very much more accurate than the old, but a line from Abu Kamal to Tel Rumailan would now cut Jabal Sinjar in two. It is unfortunate that the boundary question with Syria has not been settled, although the French have been very accommodating and have not pressed their full claim in practice. This area, apart from Jabal Sinjar itself, is typical North Mesopotamian steppe country. On both north and south of Jabal Sinjar stretch the plains which, apart from patches of winter cultivation, are desert, habited by nomad Arabs and across which are marched every year in the spring four or five hundred thousand sheep from Mosul to Syria. Along the Tigris, at its junction with the Wadi Suwaidiya, are a number of Kurdish nomad tribes who come down every winter from the high mountains north of the Brussels line.

**Mosul.**—The League of Nations Frontier Commission describe the area as follows: "Geologically the whole vilayat of Mosul belongs to

the mountain system which borders Iran on the south-west—a mountain system which is generally called by the collective name Zagros. It occupies a part of the south-western slopes of this chain, composed of Cretaceous rocks and particularly nummulitic calcareous formations and a part of their foothills, that characteristic gypsum formation which begins at Jazirat-ibn-Omar and extends probably as far as Baluchistan or even farther. This formation extends towards the west and the south-west, at any rate as far as the Euphrates, but here it is mostly covered by alluvia. The tectonic of the high mountains to the north of Mosul is very complicated: igneous rocks, serpentine, crystalline schists, up to the Eocene of the chains coming from the south-west. None of this has anything to do with the neogen plain of Mesopotamia formed by slightly undulating strata.

"The winter cold is intense, and throughout the mountainous parts of the country fairly abundant rains fall. It has also the common characteristics of 'Iraq, the great heat in summer, increased as is the case of the surrounding desert by the highly continental character of the country. The annual thermic range is Baghdad 24·3° C., Mosul 27·1° C., Diarbekir 31·8° C. The great extremes often produce a sudden and disastrous effect on vegetation. North of Kirkuk and Tekrit the date palm does not grow. The Mosul country with its semi-desert pastures on the west of the Tigris, with its better-watered and consequently more fertile clayey plains on the east, and the circle of hills and mountains surrounding it, is an area of transition, or combination of the climatic areas of the Zagros mountains, lower Mesopotamia, the Syro-Arabian desert, and the southern slopes of the Armenian Taurus—a district which even possesses certain of the characteristics of the Mediterranean climate. Its principal feature is the contrast between great aridity in summer and a clearly defined rain season in the late winter and spring."

The Mosul Province, particularly the town of Mosul, has been frequently visited and described by European travellers. The actual Brussels line has not been mapped properly, though it has been crossed at a number of points by British travellers, and a map, in view of all the circumstances reasonably accurate, has been compiled as a result of their information. As far as I am aware, no maps of this region have been prepared by the Turkish Government—in fact, they have always relied on British maps. The Branting, or Brussels, line was laid down according to the natural features as they appear on the Maunsell sheets as modified by the War Office.

**The Boundary from the Tigris to the Upper Khabur.**—The boundary is defined as follows: "From the junction of the River Tigris and the River Khabur, along the River Khabur in mid-stream, up to its junction with the river Hazil; in mid-stream, along the river Hazil to a point 3 kilometres upstream of the junction of that river with the side stream which passes by Sirmez. From this point in a direct line eastwards to

the northern crest of the valley of the side stream which passes by Sirmez. The northern crest bordering this valley up to Mount Bilakish, and in a straight line from this point to the source of the tributary of the Baijo at Robozak. Along this tributary to its junction south of Robozak with a river coming down from point 6834 east-south-east of Robozak, then following a straight line to the hill north-north-east of point 6834. Along the small river in mid-stream which comes down in an easterly direction from this hill to its junction with the river Khabur. The river Khabur downstream for about a kilometre and a half to its junction with the river coming from the Arush and Geramus district."

This leaves to 'Iraq the range of hills south of Zakho, but cuts off from communication with Zakho the Slopi plain which belongs economically to it. Zakho lies at the foot of the famous pass and astride the Khabur. It is in the Gorge of Zakho that the Kurds, called in those days Karduchis, attacked Xenophon's Ten Thousand. A good motor road crosses the Zakho Pass, and it is possible for motors to go 2 or 3 miles towards Faishkhabur. Just above Zakho is the very old arched bridge, over which Fords can with difficulty cross and proceed as far as Bersivi; apart from that road all travelling on the frontier east of the Tigris has to be done on horse or mule. A road goes from Bersivi to Shiranis, where there is a coal-mine which was worked by the Germans. The coal is of very inferior quality, resembling an oil shale. From Shiranis the track follows the valley to Pirak, which is practically the last northern village on the frontier. From Pirak there are two routes eastward, either by Patruma, Demka, and Chalak, where the Turks crossed in 1924, or by Pirak to Shiranis, Bersivi, Banike, Demka. The weakness of the Brussels line as compared with the line claimed by Great Britain is that even in winter it is possible to move along all the better-known tracks, whereas the heights 10 to 15 miles north of the Brussels line are impenetrable during the winter and extremely difficult in summer.

This area is on the borders of the Goyan country and the Sindi Guli country. These tribes have sheltered from time immemorial large numbers of Christians. The Christians have been the serfs of their Kurdish leaders, who assigned to them the best villages and best-watered land, knowing that by their industry they would develop them to the full to the eventual benefit of their masters. Some of these villages have populations of over 1500, but the majority are small and mean. The main wealth of the peasantry lies in their flocks of sheep, but a certain amount of wheat and barley is grown and harvested in early summer, and where the water supply permits rice is grown in the summer. The hills are well wooded with stunted oak, and in every village walnut trees and mulberry trees are common, as well as the poplar, which is extensively grown for timber, Mosul and Baghdad drawing the bulk of their supplies of building timber from this area. The logs are either floated down the Khabur and Hazil to the Tigris at Faishkhabur, thence

to Mosul, or further east are cut into suitable blocks and carried by donkeys.

The heights on the left bank of the Khabur form a difficult mountain barrier which nomad shepherds can cross only in summer.

The Khabur river itself in this neighbourhood is always difficult to cross because of the steep banks and the swift current. In flood season it cannot be forded at all, the only means of crossing being the wicker bridge at Nuzur and small rafts on inflated sheepskins. This reach of the Khabur is swept by avalanches on both sides during the winter months.

I might mention that it is at this point that the difficulties due to poor mapping confronted the two Governments. According to the geographical features which are described as forming the frontier, Nuzur a very important point on the Khabur, because of its wicker bridge, is within 'Iraq territory, that is to say, it actually is south of the junction of the Khabur and the stream which joins it on the right bank from Geramus, which junction was described as marking the frontier. On the map, however, it is shown some miles north of this frontier. Fortunately, General Laidonner, Special Commissioner appointed by the League of Nations, has visited Nuzur and verified this particular; so it is to be hoped that the matter will now be undisputed; but it remains as an example of the difficulties that face the administrator and the soldier in unsurveyed areas.

The following is an extract from General Laidonner's report of his visit to this area to inquire into various frontier incidents: "Raids made by tribal and village chiefs from one side of the Brussels line into the territory of the State on the other side cannot be regarded as exceptional occurrences. In that very mountainous and wild district almost the entire male population carries arms; the tribes are frequently quarrelling, and sometimes attack each other in the territory of the same State. Moreover I found that the provisional frontier, as fixed at Brussels, is not a natural frontier; certain parts of it, indeed, are purely fictitious, and can readily be crossed. Accordingly, as the frontier question is at present unsettled, and as it is so easy to cross the provisional line at various points, tribal and village chiefs naturally find circumstances very favourable to brigandage. Although no attack of serious importance has occurred, it is essential to realize that disturbances will always be possible until the frontier question has been finally settled and the line marked out on the ground.

"From time to time during last summer and autumn the Turkish authorities occupied certain villages to the south of the Brussels line with military posts, and sent patrols there. The British Government, in its protests, mentions the villages of Sinat, Dershish, Nuzur, Sul, Rusi, Hurki, and Arush, and lays special emphasis on the occupation of the village of Nuzur. Accompanied by Lieut.-Col. Jač and by two British

representatives, Mr. Jardine and Capt. Sargon, I visited Nuzur and other frontier villages and found that the existing maps do not accurately represent the Nuzur area; the villages are not shown in their true positions. For example, the frontier in the neighbourhood of Nuzur is shown as passing through the confluence of the rivers Geramus and Khabur; the village of Nuzur is further south (about 8 kms.) than the confluence, whereas on the maps it is shown to the north. Very fortunately, however, the Brussels line was described according to the configuration of the ground and the watercourses, and we were thus able to establish the line fairly accurately, and to ascertain on the spot that all the villages mentioned above are situated to the south of it. I think the Turkish local authorities are now pretty well aware of this fact, for there are no longer any Turkish posts south of the Brussels line; and if the Turkish authorities refrain from now onwards from sending military posts and patrols into this area, the question of the violation of the frontier might almost be regarded as settled."

**From the Upper Khabur to the Great Zab.**—The Branting Award continued as follows: "The river Khabur downstream for about 1½ kilometres to its junction with the river coming from the Arush and Geramus district. Along this river (leaving to the north the river coming from Qashura) to the junction of its two large branches, the first coming from Geramus and the second from Arush. From this junction along the bottom of the valley eastwards to point 6571 on the watershed between the two tributaries mentioned above, following this watershed to point 9063 east of point 6571,* [then along the crest bordering the valley of the tributary, which passes by Geramus up to its junction with the crest on the south side of the valley of the Lizan]. From the latter crest along the crest on the north side of the valley of the tributary of the river Zab which comes down from Ora, then up to a point west-north-west of Duskia and about 2½ kilometres from that place. A straight line from this point to the source of this tributary of the Zab, a little north-east of Duskia—the course of the tributary to the river Zab—downstream along the river Zab to a point 1 kilometre south of Baishuka."

This portion of the boundary between the Khabur and the Great Zab is an attempt to fix the limits of the vilayat of Mosul as they existed at the time of the armistice. It must be remembered that even up to the armistice the frontiers of provinces in this part of Turkey were not accurately known. Major Millingen, writing in 1870, says:

"Koordistan is that part of Asiatic Turkey which is comprised from north to south between Mount Ararat and the frontiers of Georgia on one side, and the neighbourhood of Baghdad on the other; while from east to west its limits may be considered to be the Persian frontier and the borders of Asia Minor and Lazistan. These limits have nothing

* The part in square brackets is that affected by the modification in the Brussels Line leaving the Alamun–Ashuta road in Turkish territory.

definite in their nature, for the simple reason that there is nothing permanent and definite in the territorial distribution of the various parts of the Turkish dominions. Whole provinces and departments, with their central towns and boundaries, are subject to frequent changes in the midst of an administrative chaos. Sometimes one province absorbs another, or the limits of the one encroach on the limits of the other; while on the frontiers of Persia large districts are pulled one way by Turkish and another by Persian pretenders, never however receiving any definite settlement."

Until the middle of the nineteenth century the Turks had not attempted to exercise more than a nominal overlordship over the Kurds of this area, who were ruled by independent princelings of Kurdish race at Amadia and Ruwandiz, while the Nestorian Ashiret Christians of the Hakkiari Mountains maintained themselves independently under their hereditary patriarch, the Marshimun. Even after the Turks had crushed the last of these independent rulers, Bedr Khan Bey, in 1847, they were not able to do more than administer the area through the tribal chiefs who farmed the revenues. No census was taken, nor were the tribes conscripted. Rival governors of neighbouring provinces endeavoured to extend the sphere of their influence whenever the chance necessities of campaign against refractory tribesmen brought under their control strong concentrations of troops, sometimes at Amadia, supplied by Mosul; sometimes at Julamerk, supplied from Van. The Turkish system of land registration, known as Tapu, was never applied to this area.

When Cuinet published the gazetteer of the provinces of Turkey in Asia, the Qadha (District) of Amadia belonged to the vilayet of Van and not to Mosul, but subsequently to this it was retransferred to Mosul.

The line itself divides the area occupied by the Bawari Bala Kurds from the ancient habitat of the Ashiret Nestorian Christians. It is not a difficult area to traverse; certainly it is easy travelling as compared with the mountains of Tiari and to the north. The ease of communication will naturally involve administrative difficulty, and it is extremely unfortunate that the valleys of Tiari and Tkhuma have been retained by Turkey. They are now deserted, save for a few Kurdish refugees, and in consequence a whole nation which had survived, speaking the very language of Christ, with a king Patriarch, and a magnificent history, is scattered homeless and hopeless in a country whose climate is so trying that a very few years must mean the disappearance of the race.

The area from Alamun to Deshtan on the Zab is very well known and has been frequently visited and described. The hills are high, well wooded, and 5 miles south of the line are several groups of prosperous villages, Christian as well as Kurd.

The Zab is a more formidable obstacle than the Khabur. There are one or two places where it is fordable in summer, but only with difficulty.

The normal method of crossing is by swimming or kelek—a set of four inflated sheepskins on which the passenger kneels while the kelekchi, who ties himself to the raft, propels it with a short, broad-bladed oar, by stretching perilously outward and scooping the water towards him. With all his skill he cannot guarantee to land you within 100 yards of any spot on the opposite bank.

**From the Great Zab to the Persian Frontier.**—The line east of the Zab is laid down as follows: "From a point on the river Zab 1 kilometre south of Baishuka—a straight line eastwards up to the southern crest of the river valley which runs south of Bayhi and north of Chal—along the southern crest of the valley of the tributary of the Zab which passes by Berijan, up to the point nearest to the source of the Ave Marek west-south-west of Shiluk—a straight line to this source—the western arm of the Ave Marek from this source to the junction of the small river which comes down from the pass between Qasrik and Nervek—along this small river up to its source—following a straight line between this source and the tributary of the eastern arm of the Ave Marek which flows into the Ave Marek north of Nervek—along this tributary to its junction—following a straight line from this junction to the watershed between the Ave Marek and the Rudbar-i-Shin—along this watershed to the nearest point to the source of that river—following this tributary and down that river just north of Shaikh Momar—in a straight line up to the source of that river—following this tributary and down the Rudbar-i-Shin to the mouth of the river which flows just south of Deh—along this river to its source—in a straight line from the source of that river to the watershed between the Rudbar-i-Shin and the tributary of the Shemsdinan Su which flows just east of Herki—in a straight line thence to the side stream nearest to this tributary—along this side stream and then along the tributary to the Shemsdinan Su—in a direct line from the junction of these two streams to the southern crest of the valley of the Shemsdinan Su—along this crest to the point where it meets the watershed between the rivers Haji Beg and its tributary which runs just east of Upah—along the line of this watershed direct to the river Haji Beg—up the river Haji Beg to the Persian frontier."

The area east of the Zab is one of the least-known areas, I suppose, in Western Asia. It is not important, is very sparsely inhabited, and very sketchily surveyed. The country resembles the country west of the Zab, but is better wooded, and in general not difficult to traverse. The new frontier does not offer the same obstacles to entry from the north as the frontier which H.M. Government claimed and which I described at the beginning of the paper.

I might mention here that, owing to the inaccuracy of the map, many administrative difficulties have occurred owing to the confusion which exists as to whether certain villages are in 'Iraq or not. For example, Nervek, which on this map is shown as being in 'Iraq, is actually north

of Mukanish, a village on the map 2 miles inside Turkey, but which has always formed part of 'Iraq and actually lies south-west of Nervek.

The frontier from here to the Persian frontier is a sparsely populated mountainous region through which the Doski and other Kurdish tribes proceed to their summer pasturages. The frontier proceeds almost due south, so as to leave the Girdi country in Turkey and then follows the Rudbar-i-Haji-Bed to the Persian frontier. This area is practically uninhabited.

**The Kurds.**—The nomad Kurds have two homes—a summer and a winter. In summer they take their own and the sheep of Mosul merchants to the pasturages in the high mountains north of Zakho and Amadia. In autumn, winter, and spring they come down with their sheep and occupy valleys and pasturages between Zakho, Amadia, Aqra and Mosul and Erbil. That is to say, they have two distinct areas where they wander; for nine months of the year they live in 'Iraq, where most of them have villages in which some members of the tribe remain the whole year. In this they differ from the Arab nomads who usually have only one dirah—pasturage area. Inside this area, which is usually very extensive, the Arab nomad wanders at irregular intervals following the pasturage. He has no stone buildings, his home being a tent. It is possibly inaccurate to describe most of the Kurds as nomads; their summer migrations to the high plateaux could be likened to the English habit of journeying to the seaside in summer. Most of the tribes, at any rate the smaller of these nomadic tribes, have villages, and cultivation which is never abandoned.

Before the paper the PRESIDENT said: We are to hear to-night about that much-disputed and thorny question, the boundary between 'Iraq and Turkey as settled by the League of Nations. It is not a political question, at least on this side, because we have frankly accepted the boundary as defined by the League of Nations; that is to say, that Brussels Line or, as it is sometimes called from the statesman who fathered it, the Branting Line, of which you have no doubt seen a good deal in the papers. It was felt that, though this Society has no connection with politics and though politics are rigidly excluded from its meetings, it was desirable, since the political question for us at any rate was over—I do not say there may not be some attempt to open it from the other side—that we should be informed by some one with expert knowledge, who had been upon the spot, what is the nature of that Brussels Line, what are its merits as a boundary, if it has any, and what its defects, if it has any, may prove to be. That expert knowledge is supplied by Major Lloyd, who, in the service of the 'Iraq Government, not of our own, has administered the important town of Mosul, which is most in question. He will treat it as far as possible as a geographical and ethnographical question, and I hope he will tell us what is the nature of the Brussels Line as it has been defined for us by the League of Nations, and how far any other line which might reasonably have been adopted would have been better; not that this Government has the smallest intention of protesting in any way against or deviating from the decision of the League of Nations. We may as well know as much as we can about the physical nature of the country through which that line goes, and

about the peoples who live upon both sides of it, who, as in the case of most Eastern peoples of nomadic or semi-nomadic habits, are apt to be now upon one side of the line and now upon the other. All this I hope Major Lloyd will be able to tell us, and I will ask him to address you.

*Major H. I. Lloyd then read the paper printed above, and a discussion followed.*

Sir PERCY COX: A frontier line is not a subject on which it is easy to be expansive, and I have not much of interest to add to what Major Lloyd has told us to-night. There are, however, one or two points which I should be glad to comment upon or amplify. Firstly, as regards our negotiations with Turkey. At the deliberations which took place at Lausanne in connection with the elaboration of the treaty a point was reached when everything had been practically settled except the question of the 'Iraq Frontier, and in regard to that no common ground was apparent between the claims of the Turks and ourselves. It was accordingly decided to complete the treaty and leave the question of the 'Iraq frontier for direct settlement between the Turks and ourselves.

I believe Lord Curzon, who was representing us at Lausanne, thought at the time that it was of no use attempting a direct settlement with Turkey for this same reason, namely that there was no common terrain on which to negotiate, and he would have preferred to go to the League at once. The Turks, however, persistently pressed for a period in which to seek a direct settlement with us. They asked for a year; we suggested six months, and finally it was fixed at nine months. At the end of nine months I was sent to Constantinople —I should like to emphasize that it was by the Labour Government—to endeavour to reach a solution with the Turks. I took with me for negotiation the frontier which Major Lloyd has told us about to-night—the result of months of study and examination on the spot. Every possible aspect had been considered in the attempt to find a really good frontier, and incidentally an immense amount of air reconnaissance was carried out in a perfectly ghastly country for flying, as you will have understood from some of the pictures which the lecturer has shown us on the screen.

I was instructed to offer this frontier as the best possible, and to express my readiness on behalf of His Majesty's Government to negotiate such modifications of detail as might be necessary for local reasons. But I could find no common ground upon which to negotiate. The answer of the Turkish delegates to my proposition was that they thought, on the contrary, that we should agree in principle to the rendition of the Mosul Vilayet, and that if we did they were prepared to discuss possibilities of economic compensation for us. But in fact we were discussing a territory for which we had taken a mandate, and no such compromise was conceivably possible; so after six weeks of fruitless argument I was told to break off the negotiations.

Now there has been a Frontier Award by the League of Nations. The line in question no doubt provides a possible frontier, though one is better than another naturally. But all those ranges of hills, hills, and hill crests offer a possible frontier, and if we can by any means get the Turks to come to a reasonable understanding on this question there should be a great future for 'Iraq. But the most disturbing issue, to my mind, is the fate of the Assyrian Christians, of whom there about 80,000 men, women, and children; half of them are across the present frontier and half of them on this side of it. In the case of the frontier for which I was instructed to press, we hoped there was sufficient suitable country on this side of it to enable us to bring all the Christians inside

our limits. That idea has gone by the board now, and I must admit it is a great disappointment to me. One would have thought that the fate of that Christian nation, small as it is, was a matter for which Christendom in general should have had some concern. We (*i.e.* Great Britain) have done all we can, but Christendom has done nothing at all, and the fate of those people hangs on the negotiations which are now going on with Turkey. We can only hope that a reasonable solution will be arrived at.

I cannot deny myself this opportunity of paying a tribute to the devoted band of Englishmen of which Major Lloyd, our lecturer to-night, is a member. During the war I was Civil Commissioner with the Army, and had to organize civil administration behind the Army as we advanced. In the natural course of events all the administrative personnel of the Turkish *régime*, practically all Turks, retreated with the Turkish army and we had to replace them with British officers. The careers of the latter were safe as long as their units remained in the country, but when the time for demobilization came, and when, a little later on, I was sent out to organize a native administration as the only alternative to evacuation, there clearly had to be great reduction in the British personnel; and though we still had to retain a small proportion of them, the future for those who remained was a most uncertain one. They had no guarantee whatever of an assured career; they simply stayed on, working with the utmost devotion year after year up to now, in suspense all the time, and simply kept going by enthusiasm for the country and their work. Meantime they were losing with more and more certainty all chance of a career at home, while in the absence of any guarantee from the British Treasury their future in 'Iraq was extremely problematical. Now we hope that by the grace of God and the League of Nations their future career is assured, for they have got definite contracts with the 'Iraq Government. But we cannot easily realize sufficiently what we owe to this devoted band of British officers, and I am very glad of this opportunity to pay tribute to them.

Sir ARNOLD WILSON: I wish that Major Lloyd could have been a little less modest and a little less reticent: the slides he has shown us to-night recalled memories to me of battle, murder, and sudden death, of hopes which have mostly gone by the board, and of fears some of which have been realized. He is clearly not a stamp collector, or he would have remembered that there was considerable doubt as to the future of the Mosul Vilayet when we first occupied it, for a special series of stamps was issued for use in post offices in that vilayet by way of emphasizing the fact that, as between ourselves and the French, its status had not been decided.

Too great emphasis has perhaps been laid on the strategic importance of the Brussels Line *versus* our Line. There is undoubtedly a strategical aspect, but I think, as Sir Percy Cox said, the main considerations that actuated us in accepting the Brussels Line, although we should have liked a better line, were administrative. On administrative grounds it is of great importance to have a good line to avoid raids and discontent and to keep the tribes on either side of the frontier together as far as possible. It is possible to over-emphasize the strategical aspect. If ever Turkish troops are sent to capture the Mosul Vilayet they will not be sent over the country we have seen on the screen this evening. They will come from the west. There is an easy route open to them by the Baghdad railway. It is true that a few hundred kilometres of that railway lie in French territory, but troops can be transported up to a point not far from Muslimiyé by rail, and transported in motors and taken across by road to the point where the Baghdad Railway re-enters Turkish territory. Thence they can be shipped on to Nisibin or any other convenient point.

I wish also that Major Lloyd had told us a little more about the other Mosul frontier, that of Syria. He has paid tribute to the good nature of the French in not pressing us too much; but I fancy that it would have been exceedingly inconvenient to them, pressed as they were themselves, to have attempted to take over those portions of the Mosul Vilayet which were in dispute between us. I think also they are occupying 'Iraq territory near Abu Kamal. There has been a good deal of give and take, but it has not been all giving on their side and all taking on ours.

I had a letter last month on this subject from a friend (not an Irishman) saying that "if things go on as at present finality is the last thing we shall reach." If that is the case, it is partly due to the absence of reliable maps, of which Major Lloyd has complained. It is rather remarkable that we should have to depend in 1926 mainly upon the very remarkable series of maps made by Col. Maunsell, whose absence to-night we all regret, and to whom we owe a very great debt. They were compiled at the beginning of the present century by Col. Maunsell after a long series of tours. Those maps, which have been corrected from time to time, have never been fully replaced by any other series on the same scale (1/250,000), although we have been in the Mosul Vilayet for the last five or six years. We have a 1-inch survey of practically the whole flat area of Mesopotamia, and a 6-inch survey of quite considerable portions of it. But apparently there is no ¼-inch map of the essential portions of the frontier. I have had sufficient experience of laying down a frontier from bad maps to know the immense importance of having good maps. I can only hope that during the next few years the necessary maps will be prepared, so that when we come to settle this frontier with Turkey it will be possible to do it with some approach to finality.

In regard to the Herki and other nomads, Major Lloyd suggested that it was unlikely that they would continue to migrate from 'Iraq into Turkey owing to the division of their country between two Powers. I am not at all sure that that will happen in practice. The Jaf and other tribes, who have their summer pasturage exclusively in Persia, contrive to emigrate regularly between 'Iraq and Persia. There are certain advantages in having summer and winter resorts in different countries. It may be necessary to pay taxes twice, but there is always a sporting chance that it may be possible to avoid paying at all, and the Jaf have in the past been extraordinarily successful in that respect. I do not think that the nomadic habits of Kurdish tribes will be suppressed.

The Brussels Line cannot, in my opinion, be regarded as a final settlement. There must be further negotiations before we can settle the matter. It is a frontier which has very little in its favour from the purely administrative point of view, and not much in its favour from the broader point of view—it does not settle the great question of the Assyrian Christians, and, what perhaps is more important, it does not give the peoples who are living immediately north of it access to a market. There are 20,000 or 30,000 tribesmen living north of the Brussels Line who cannot obtain access to a Turkish market without great difficulty, and will have almost equal difficulty, owing to their exclusion from 'Iraq, in obtaining access to the town of Mosul or its ancillary towns. There will have to be further negotiations, and all that we and the people of 'Iraq can do is to be patient and wait until public opinion in Turkey becomes more favourable to an amicable settlement of these matters. I do not think that time will be long in coming.

The PRESIDENT: It is satisfactory to be reassured that after all the Brussels

Line is not so bad, though some of the views we saw might have created a different impression! It is an extraordinarily interesting country. We call it Mosul or 'Iraq in our own times, but it was anciently just Assyria. In the south was the city of Asshur and in the north Nineveh, Calah, and Arbela. It was rich enough then to breed and maintain a mighty imperial people. Year by year its kings marched up into those great hills which Major Lloyd showed us on his map, and tried to hold them, but were never quite successful; and eventually the country was overrun and the Assyrians were overwhelmed by people who came through those hills. I do not know what a Turkish army may do in the future; probably modern conditions will bring it, as Sir Arnold Wilson said, from the west; but it was from the north that the people who overwhelmed the Assyrians came. I hope that this is not an omen, and that such will not be the future fate of 'Iraq!

The photographs which were shown gave a very good idea of the country. A good account of the Mosul Vilayet and of the people there is given in a book of the late Lord Percy's. To my mind it is much the best description of the great Alpine district of Hakkiari to which Major Lloyd referred, and to that book I should go if I wanted an account of the country. It also contains a very interesting account of the later stages of Turkish rule in the country. It is astonishing to see how well, in the face of all their difficulties, the Turks succeeded in establishing an administration in that country and how they managed to maintain their rule.

The hour is late, and I will not enlarge on that. We owe it to our lecturer that we have kept off anything like contentious politics. I do not suppose that we have heard the last by any means of contention about Mosul; but for the present the line is fixed for us, and, as I said at the beginning, we may regard the political question as over. Since our lecturer has done that for us, and has manfully dealt at very short notice with an extraordinarily difficult question in an exceedingly difficult country, we owe him our very sincere thanks. I know better than anybody else what his difficulties have been in getting his slides and notes together at very short notice; also, he has been compelled to put up with photographs which he had not himself taken and which had not been made with the intention of being used to illustrate such a lecture as this. It is far easier to lecture if one has had long notice and been able to provide oneself with views which will exactly illustrate what one has to say. Major Lloyd has not had that advantage, but he has extricated himself very well from the difficulties into which his kindness in responding to our invitation landed him.

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## THE NYASALAND SECTION OF THE GREAT RIFT VALLEY

F. Dixey, D.Sc., F.G.S.

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### 1. Introduction.

IN the course of the Geological Survey of Nyasaland during the last three years some observations have been made that are perhaps of considerable interest in connection with the history of lake Nyasa and the development of that part of the Great Rift Valley in which it lies, and

in the light of these and earlier observations it has been possible to determine the sequence of events outlined in the following paragraphs.

In his well-known account of the Great Rift Valley (II.) * Professor J. W. Gregory states that this remarkable trough extends from Lebanon to the Sabi River and includes the rifts in which lie, for example, the Dead Sea, the Red Sea, lakes Albert, Tanganyika, and Nyasa, and the Shire River; that in late Cretaceous or early Tertiary times there arose a great meridional arch, the crown of which, upon the relief of lateral compression, subsided between parallel fractures to form the Rift Valley; that the faulting began in the Oligocene (II., p. 204) and was continued principally in the Pliocene and in the Pleistocene (II., p. 105); and that the movements were accompanied from time to time by great volcanic activity. Furthermore, with special reference to the Nyasan Rift, Professor Gregory has adduced evidence, admittedly rather uncertain (II., p. 298), that an arm of the sea extended up into lake Nyasa during the Oligocene, while A. R. Andrew and T. E. G. Bailey have shown (I., p. 223) that lacustrine shell beds, believed to be of Recent geological age, stand at a height of 700 feet above the present level of Nyasa. It should be mentioned that the first connected account of the geology and physiography of Nyasaland as a whole is due to Andrew and Bailey, and the observations of these authors have served as the basis for subsequent work.

The present paper puts forward the view that in the early Cretaceous, or possibly late Jurassic, the initial uplift in the Nyasa region took the form of a gentle anticlinorium,† and that the more or less meridional troughs so produced were occupied in due course by rivers and possibly by lakes; then at a later date rift faulting began, and this continued intermittently throughout a large part of Tertiary and Quaternary times. Moreover, there appeared several sets of intersecting faults that extended into the region bordering the main rift on either side, and of these the meridional faults were frequently of later date than those of diagonal trend. A similar sequence of faults has been observed in Tanganyika Territory (II., p. 292). The volcanic history of the area appears to have been very largely confined to a brief phase, developed at the northern end of lake Nyasa, that took place in the late Tertiary or early Quaternary period. Finally, while the later work has not yet yielded any evidence to support the hypothesis of a marine sedimentary phase of Oligocene age, the lacustrine beds formerly thought to be of Recent age are now known to date back to Pliocene times and to rest with strong unconformity upon post-Cretaceous lacustrine sediments that are possibly of Miocene age. It will be shown that lake Nyasa has varied in area

* The numerals in parentheses refer to the Bibliography on p. 137.

† "Anticlinorium" is used by geologists to denote a larger anticline upon which are superposed a number of minor anticlines running parallel with it; but the word may be criticized as hybrid.—Ed. *G. J.*

and in extent from time to time, and reasons will be put forward in support of the view that the rift-faulting of the region was due to long-continued tensional stresses that succeeded the original uplift.

In the following account of the Nyasaland section of the Great Rift Valley it will be convenient to regard this section as comprising an upper rift occupied by lake Nyasa and a lower rift traversed by the Shire River, which drains the lake at the southern end.

The country in the immediate neighbourhood of the Rift Valley is made up largely of various gneisses and schists, with intrusions of granite and related rocks, which are all probably of pre-Cambrian age; these ancient rocks are overlain by a few relatively small patches of sedimentary rocks belonging to several different geological periods. The earliest sediments are those of Karroo age, which are exposed both at the northern and at the southern end of the rift, where they are in general faulted down into the crystalline rocks. These sediments constitute the local coal-bearing strata, and they are thus of considerable importance to Nyasaland (IX.). Moreover, at the foot of Mount Waller, on the north-western shores of lake Nyasa, they have recently yielded a valuable collection of reptilian fossils (V.); remains similar to these are well known from the Beaufort Beds of South Africa, but they have not previously been recorded from any part of Central Africa. It should be noted that the Rift Valley faults have cut right across the foliation of the crystalline rocks as well as the boundary faults of the Karroo Series.

The second group of sediments consists of the Dinosaur Beds of late Jurassic or early Cretaceous age (V.), which rest unconformably upon all older rocks; the fossil Dinosaurs recently discovered in them are related to those of Tendagaru in Tanganyika Territory, 350 miles further east, which are at present being examined by an expedition sent out by the British Museum. It appears probable that the Dinosaur Beds accumulated in a depression, on the site of the northern end of lake Nyasa, which developed as a result of movements that took place some time before the main Rift Valley faulting began.

The third group of sediments consists of the Lacustrine Series (V.), which rests unconformably upon the Dinosaur Beds and is itself split into sub-groups by several unconformities. One sub-group has yielded fresh-water molluscs and, more recently, a few mammalian bones, and a preliminary examination of these fossils shows that the enclosing beds date back into Tertiary times; the examination of the Lacustrine Series may be expected therefore to yield valuable data in connection with the development and structure of the Rift Valley. It is interesting to observe that the Beaufort reptiles, the (?) Cretaceous Dinosaurs, and the Lacustrine mammals all occur on the north-western shores of lake Nyasa within but a few miles of one another, and also that it is the discovery of these fossils within the last twenty months that has made possible the recent important revision of the geology of this region.

During the deposition of the Lacustrine Series, probably towards the end of the time represented by the mammal-bearing beds, volcanic activity became manifest at the northern extremity of the Nyasan Rift Valley, and consequently a great quantity of alkaline lavas and tuffs accumulated there upon the floor of the rift. A subsequent fall of several hundred feet in the level of the lake gave rise to a wide but variable fringe of lacustrine deposits of Recent geological age.

**2. The Nyasan Rift Valley.**

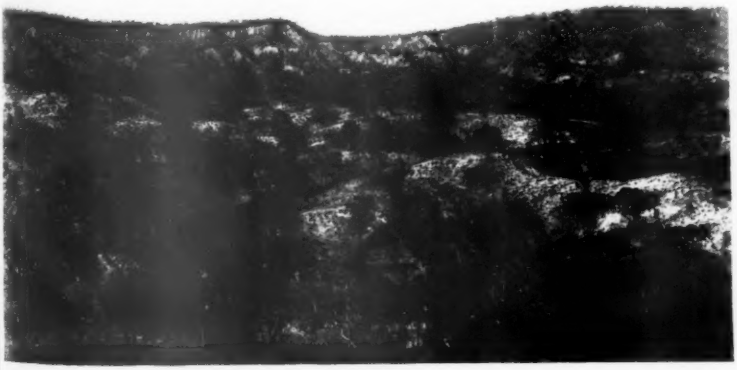
The Nyasan Rift Valley, which is about 50 miles in mean width, takes the form of a great trough that runs almost due north and south over a total distance of nearly 400 miles. It intersects various plateaux of high average altitude; to the north these plateaux range from 7000 to 9000 feet above sea-level, whereas those to the south are from 3000 to 5000 feet. The floor of the rift, on the other hand, descends near the northern end to a depth of several hundred feet below sea-level, with a maximum descent of 700 feet below this datum, whereas near the southern end much of it stands at 800 to 1000 feet above sea-level; accordingly, the rift is very much deeper at the northern than at the southern end, and the maximum depth occurs in the north-eastern part, where the scarp of the Livingstone Mountains overlooks the bottom of the trough from the extraordinary height of more than 10,000 feet. Moreover, the Nyasa basin as a whole is asymmetric, as has been pointed out by Professor Gregory (II., p. 305); the eastern side is due to one main fault, whereas the western part of the downthrown block has been dropped in steps by parallel faults, with the steps sloping to the east.

The walls of the rift are generally steep, and locally even precipitous; frequently the descent from the plateau margins is broken by one or more fault-steps, and additional steps, relatively broad and low, extend across the floor of the rift. Usually these fault-steps are inclined towards the rift, but not infrequently they are inclined in directions parallel with it. Although the trend of the rift as a whole is north and south, the walls themselves have assumed a zig-zag course as a result of the intersection of two sets of faults that run respectively north-north-west and north-north-east; furthermore, these faults sometimes terminate against, and are therefore older than, additional faults that follow a northerly course. Running parallel with the main rift there are, particularly on the western side, minor rifts standing at various elevations; these rifts are separated by rectilinear crystalline ridges ranging up to 30 miles in length, and at the northern end of the lake three such rifts may be seen to run side by side over a distance of nearly 30 miles.

The greater part of the floor of the main rift is occupied by lake Nyasa, around which extends a fringe of lake plains of varying width. The slope of the plain lying along the north-western shores of the lake is

*Blocks of Tertiary lacustrine strata tilted towards floor of Rift Valley, Luketa*

*Kaporo Bay, North Nyasa, and mouth of Songwe River*



*Looking across the Mwakasyunguti Valley from the south-west*

continued for many miles below lake-level almost to the sub-lacustrine foot of the Livingstone Mountains, where the maximum depth of 2200 feet has been recorded.* Farther south, between the mouth of the South Rukuru River and Nkata Bay, the adjacent section of the lake floor is tilted in the opposite direction, towards the foot of the western plateau, which rises abruptly from the floor of the lake in a manner similar to that of the Livingstone Mountains. In a third and shallower section extending to the southern end of the lake, the floor is gently concave, and here a well-developed drowned topography may be observed along many parts of the coast.

The lake plains are sometimes built up of great thicknesses of sand and clay of late Recent age, as in the country west of Domira Bay, for example, but sometimes they consist of even crystalline platforms that dip gently, except where traversed by young faults, below the level of the lake, as in the area west of Kota Kota; these crystalline platforms are usually overlain by thin patches of pebbly gravel. The north-western plain, however, is traversed by a number of crystalline fault-ridges running parallel with the lake-shore, and between these ridges lie narrow strips of the sediments that make up the Dinosaur Beds and the Lacustrine Series.

Towards the close of the period of deposition of the Lacustrine Series, the crystalline ridges were more or less completely buried under these sediments; as the waters of the lake receded, the streams that ran towards the lake over the surface of that time gradually cut their way down to the buried ridges, and then in due course incised deep narrow gorges through them; at the same time the secondary streams opened up wide transverse valleys in the soft sediments lying between the ridges. Consequently, in this region the rivers of to-day may be observed to run directly across the grain of the country in their progress from the foot of the western scarp to the lake-shore, so that instead of flowing along the broad shallow troughs running parallel with the coast they first enter the troughs on one side through a deep narrow gorge and then depart from them again by a similar gorge situated almost directly opposite. Some of the weaker streams were naturally unable to maintain their courses across the hard ridges, so that after a time they were obliged to abandon the gorges they had already cut, and these now remain only as wind-gaps; the streams were then obliged to find an easier course to the lake through the softer rocks, or else they were captured by the headward erosion of the tributaries of neighbouring more vigorous streams.

In many places old storm beaches and lines of sand-dunes run parallel with the shore, and between them swamps and lagoons may often be observed; ridges of similar form may continue below the water-line, and these sometimes make landing very difficult for the lake craft.

* In 'The Tanganyika Problem' (London, 1903), p. 123, J. E. S. Moore gives 2580 feet as the maximum depth of lake Nyasa.

Lacustrine deposits and raised beaches show that the level of the lake has varied considerably from time to time. The older lacustrine deposits range from 200 to 1000 feet above the present level of the lake, while gravels and raised beach deposits of very late age stand at the following successive levels: 400, 150, 25, and 15 feet. The lake appears to have been able to effect but very little lateral erosion into the crystalline rocks that abut upon its shores, although severe storms are of common occurrence at certain seasons of the year; this is probably due to the circumstance that the rather wide seasonal and periodical variations in the level of the lake, combined with the instability of level indicated by the lake beaches, have rarely if ever enabled the waves to concentrate their efforts within suitable limits.

The fact that the water of the present lake is fresh, and that the only fossils found in the older lacustrine deposits are of fresh-water origin, indicates that the lake has had a more or less continuous outlet to the sea almost from the beginning, in spite of the vicissitudes it has undergone.

**3. The Shire Rift Valley and Associated Fractures.**

An examination of the uplands bordering the Shire Rift shows that there are several additional branches of the rift system almost as important as that of the Shire itself (VII.). Actually, the rift system in this region appears to comprise two main series of fractures that run approximately N.N.W. and N.N.E. (see Figs. 1, 3). For instance, the Shire Rift itself follows these two directions in turn; it may thus be regarded as consisting of (1) an Upper Shire Rift, running N.N.E., that extends from Malombe to the Murchison Cataracts, and (2) a Lower Shire Rift, running N.N.W., that extends from the Murchison Cataracts to Port Herald. Running parallel with the Upper Shire Rift is the long depression that includes lake Chilwa and the adjacent low country, and also the elongated Palombe–Tuchila plain that extends from the Chilwa plain past the western foot of the Mlanje Mountains to the lower course of the Ruo River; this depression not only passes, at its northern end, into lake Chiuta and the upper Lujenda valley,* but also it stands in practically the same line as the Urema Sunkland of E. O. Teale and R. C. Wilson,† which lies a little further south across the Zambezi.

Running parallel with the Lower Shire Rift, on the other hand, is the depression that extends towards the S.S.E. from the southern end of lake Nyasa and includes lake Malombe, that part of the Upper Shire Rift that it crosses obliquely, the even plain north of Chikala Hill, lake Chilwa, and the eastern foot of the Mlanje massif. Lakes Malombe and Chilwa are thus seen to occupy depressions situated at the intersection of a N.N.W. rift by two N.N.E. rifts, and the Murchison Cataracts to

* See also F. E. Studt, "The Geology of Katanga and Rhodesia," *Proc. Geol. Soc. S. Africa*, 1913, p. 44; and J. E. S. Moore, 'The Tanganyika Problem' (London, 1903), p. 48.

† "Portuguese East Africa between the Zambezi River and the Sabi River," *Geogr. Journ.*, 46, 1915, p. 286.

be situated in the broken country at the angle in the Shire Valley in which the Upper Shire Rift and the Lower Shire Rift intersect. Moreover, the Shire Highlands are seen to constitute a broadly diamond-shaped upland area bounded by four branches of the rift system. This upland area however is not of uniform height, but is tilted towards the east in a direction parallel with its shorter axis. Consequently, a traverse from west to east across the broadest part of the Shire Highlands and the

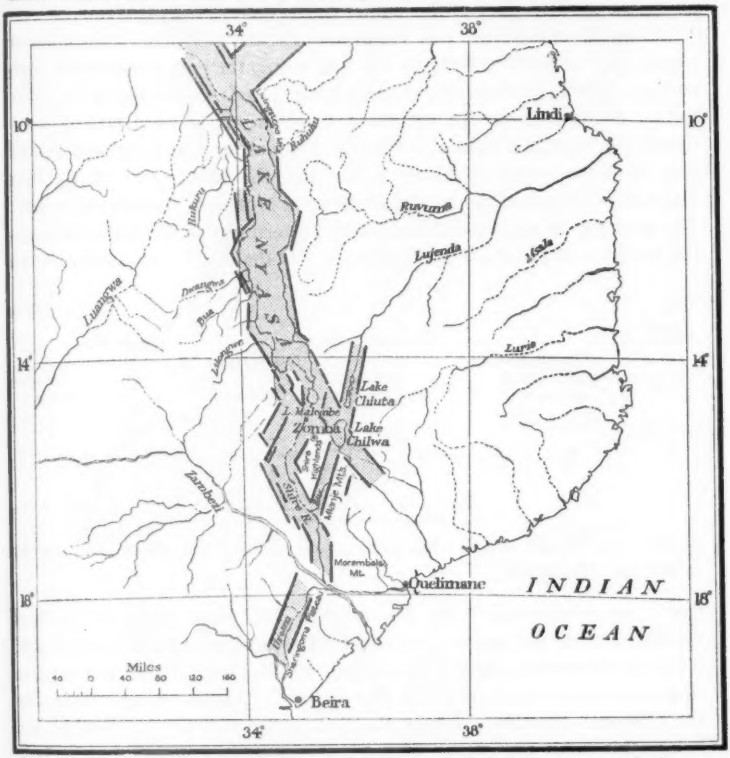



*Figure* 1. *The Nyasan Rift Valley: associated fractures and down-faulted areas.*

adjacent part of Nyasaland would show (Fig. 2) an abrupt descent from the Kirk Mountains into the wide floor of the Shire Rift, followed by an abrupt but stepped rise to the Shire Highlands, and a long gentle slope down to the foot of the magnificent step-faulted scarp forming the western face of the Mlanje massif.

It would appear that the rift system described has resulted from faulting that took place at several distinct periods separated by appreciable intervals. For instance, the Upper Shire Rift did not assume its present

form until after the Malombe–Chilwa Rift was well established and its floor reduced to an even plain; this plain was then fractured along the line of the low Makongwa scarp that runs for nearly 20 miles in a northerly direction from near Chikala Hill, and forms the eastern wall of that part of the Upper Shire Rift. Doubtless connected with these movements is the "drowned" coast of lake Nyasa. At an even later date additional fracturing left the Mpimbi–Namitembo valley plain standing 250 feet above the modern floor of the Upper Shire Valley.

The walls of the Shire Rift Valley are bold and well defined throughout a large part of their course; at different points they are respectively high and precipitous, broken into ascending fault-steps, or merely of irregular form. South-east of lake Malombe, however, the eastern wall is practically absent over a distance of nearly 20 miles, or is at least represented only by a low scarp of relatively late age, the Makongwa Scarp, that separates this part of the Rift Valley from a branch of slightly older date. The next gap of importance lies on the western side of the valley between the southern end of the Kirk Mountains and the ridge of crystalline rocks

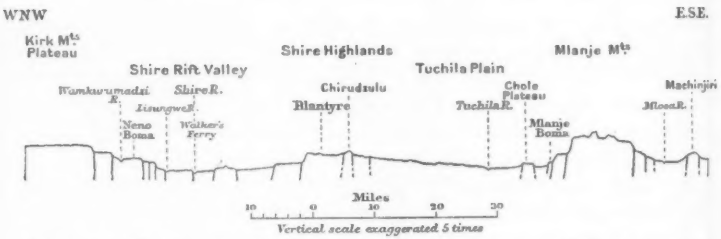



*Figure 2. Section across Southern Nyasaland from Kirk Mountains to Mlanje Mountains.*

that runs southwards from Namalambo Hill near Chiromo to Port Herald. Since this gap is occupied exclusively by rocks of Karroo age, it has doubtless originated in consequence of the low resistance to erosion of these rocks as compared with that of the Crystalline Series. Opposite the Chiromo–Port Herald ridge the Rift Valley widens considerably, and below this point the course of the rift is indicated mainly by the bold western scarp of the isolated Marambala Mountain.

It has already been mentioned that the walls of the rift valley are of irregular character; this variability depends partly upon the nature of the faulting to which the walls are due. Sometimes the sinking of the floor of the rift has been brought about by displacement along a simple fracture leading to the formation of a bold high scarp, such as the side of Zomba Mountain overlooking the Lisanjala Valley, or the scarp of the Angoniland Plateau facing the south-western arm of lake Nyasa. Sometimes, however, the displacement has taken place along parallel fractures, resulting in several well-defined steps that lead successively

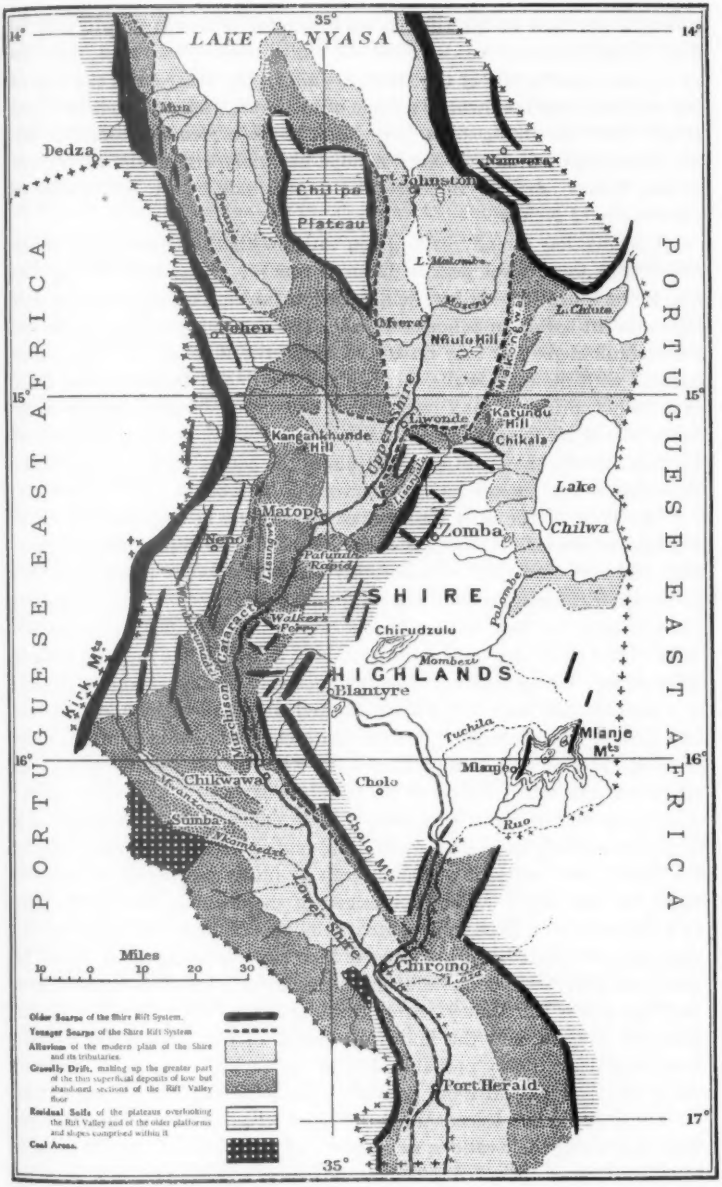



*Figure 3. Physiographical features of the Shire Rift Valley.*

down to the floor of the rift; good examples of this structure may be seen along the western side of the rift valley in the Neno area, and also along the western side of the Bwanje Valley. In other cases the side of the rift may take the form of a slope of moderate gradient such as would result from the tilting of a large fault-block or from subsidence unaccompanied by faulting; such a slope has given rise to the Lirangwe-Lunzu Valley north of Blantyre and to that side of the Rift Valley in the vicinity of Ncheu.

Evidence has already been given to show that different parts of the rift system were developed at different times. This conclusion applies also to the Shire Rift Valley itself, since late faulting took place long after the main rift had been delineated; such late faulting gave rise to the low broad fault-steps that may be traced along the floor of the Rift Valley parallel with the main walls. It is along the line of faults such as these that the hot springs of the Liwonde area and of the Mwendangombe River north-east of Neno are situated, and it may be mentioned in addition that earthquakes occur not infrequently along the course of the Rift Valley; these phenomena clearly indicate the youthfulness of the later movements.

The floor of the Rift Valley may accordingly be expected to be of variable character. Doubtless some of the higher hills and groups of hills that here and there rise abruptly out of the valley plain are relicts of the pre-rift topography of the old plateau traversed by the rift valley; nevertheless, the floor of the rift has been much modified by the action of the Shire River and its tributaries as well as by the late faulting already referred to. Consequently, while the floor may be described in a general way as consisting largely of a broad faulted and tilted valley plain overlain to a greater or less extent by pebbly drift and by fine alluvium, the older fault blocks and marginal platforms are nevertheless usually of a rocky character and much dissected by tributary streams. It would appear that upon one or more occasions a wide valley plain, consisting of a rocky floor thinly overlain by alluvium, had scarcely been completed by the Shire River before it was again rent by faults and the river forced to begin its work anew. The fault-angles of the down-faulted blocks were in some cases soon filled in by a great thickness of alluvium, while the upstanding parts were largely stripped of their superficial deposits. It will be seen later that these young faults have considerably influenced the modern drainage of the Rift Valley. From consideration of the wide valley-plains, past and present, and the known condition of the river within historic time, it appears highly probable that at an earlier stage in its development, the river was far more powerful than is its modern representative.

Until within late Recent times the Shire River and its tributaries have been degrading their valleys, as is shown by the flights of alluvial terraces characteristic of them. Previously, however, aggradation had gone on to a considerable depth and wide extent, until the old floor of the valley was completely buried apart from a few isolated hilltops. Several

primitive stone implements have recently been found on these terraces, as well as upon a low lake terrace, but they are not of sufficiently definite character to enable the age of the terraces to be determined.

Whereas the upper and lower sections of the Shire Valley are characterized by broad stretches of alluvium and by gradients that are almost negligible, the middle section is remarkable for the variable nature of the country it encompasses, and for a relatively high gradient down which the Shire River flows in the long line of intermittent rapids known as the Murchison Cataracts. Moreover, while the development of the two former sections has been accompanied by down-faulting movements that have not greatly affected the river except to cause it to desert its established valley plains and to refill the fault angles with alluvium, that of the former has been influenced by more frequent and more vigorous movements that have greatly altered the course of the river from time to time. These differences are apparently due to the location of this part of the valley at the intersection of two more or less rectilinear segments of the Shire Valley Rift. In its course from the top of the Matope Rapids to the foot of the Murchison Falls, about 12 miles above Chikwawa, the Shire River traverses a distance of about 45 miles and falls through a vertical height of about 1250 feet; probably not more than 200 feet of this drop is attained by precipitation over actual falls or steep cascades, while the remainder is brought about principally by the intermittent rapids already referred to.

The extensive planation of the rock floor of the Rift Valley has already been adduced as evidence of the modification of the pre-rift topography carried out by the river and its tributaries. Additional evidence is afforded by the deep water-gaps traversed by the Shire on the Matope–Chikwawa section. The best example of such a gap is that at Patamanga, about 22 miles north of Chikwawa. Here a high narrow hogsback ridge of crystalline rocks runs out towards the river in a W.N.W. direction from the eastern side of the rift, and near the river it rises 600 feet above the floor of the valley. Above it the river winds across an alluvial basin open on the S.S.W. side, but elsewhere partly enclosed by low hills. Instead of escaping across the low country by a slight detour, however, the river flows straight towards the high ridge and intersects it by a deep V-notch that rises steeply above the sides of a little rocky gorge; below the gorge for a distance of several miles the river traverses a series of rapids in a country of low relief. Accordingly, since the river was first superimposed upon this ridge, the surrounding country has been lowered by erosion, doubtless assisted by faulting, to the extent of not less than 600 feet. Furthermore, in the Lower Shire Valley, west of Chikwawa, the tributaries of the Shire are incised into an extensive and well-defined platform, resting mainly on Karroo sediments, that stands 750 feet above the level of the main river, while a much younger platform of alluvial origin overlooks the river from a height of 90 feet.

An important subsidiary watershed exists in the Shire Valley near Ncheu, and it is upon this watershed that the rift containing the south-western arm of the lake gradually dies out. Flowing northwards from the watershed, which takes the form of a low broad ridge dying out in an easterly direction, is the Bwanje River, and running more or less parallel with it are several smaller rivers. The head of the Bwanje Valley is separated from the Malombe section of the Shire Valley by a low rocky area that rises only slightly above the level of these two valleys.

It is of interest to trace the effect of the younger faults that traverse the floor of the Rift Valley upon the modern drainage system. Wherever the eastern walls of the rift valley are high and well defined, it will be seen that the Shire River runs more or less along their foot, although wide valley plains extend away towards the west; moreover, the western tributaries are in general much longer than the eastern. These effects are doubtless due to late faulting that has given the floor of the rift a general tilt towards the east; in support of this it may be noted that in some places, over distances of many miles, the river can be seen to flow at the foot of a low scarp, about 200 feet high, that is thrown forward a little from the foot of the main scarp so as to intersect the margin of a former valley plain. Between lake Malombe and Liwonde the river traverses a wide alluvial plain that is overlooked on either side by a low fault-scarp. Certain of the larger tributaries of the Shire are similarly affected by faults. For instance, the upper Wamkurumadzi, the upper Mwanza, and the middle Lisungwe all run more or less parallel with the main river; in these sections the Wamkurumadzi, the Lisungwe, and probably also the Mwanza, all run along the fault angles of narrow blocks that are tilted towards the west. But upon leaving the fault angles and reaching the relatively open plain the rivers, being no longer constrained by the faults and the original steep down-valley slope of the ground, come directly under the influence of the late easterly tilting, which has caused them to change their courses and swing round so as to meet the main river at a moderate angle. With these and similar exceptions the tributaries of the Shire usually follow courses more or less at right angles to it. As a result of late lowering of local base levels, apparently by faulting, the rivers have in places been constrained to cut deep incised meanders into the old valley plains near the foot of the fault scarps referred to.

The soils of the Rift Valley are of very variable character, and they may be broadly classified according as they occur on the modern alluvial plains, on the old valley plains, or on the higher levels. The soils of the alluvial areas are generally light and fertile, although locally they may be either very clayey or sandy; they constitute the valuable cotton lands of the Shire Valley. The soils of the old valley plains are usually thin, gravelly, and interspersed with rock fragments and pieces of angular

quartz moreover, the solid rocks, which are frequently hard and unweathered, are rarely far below the surface of the ground, while they may even form numerous low outcrops. Nevertheless, where soil has been able to accumulate in hollows and in the less disturbed areas, it is of good quality and forms good tobacco land. The generally poor soil conditions that prevail on the old plains of the Shire Valley are due to the frequent disturbances that have affected this region within late geological times. On the higher levels, that is on the older platforms of the rift valley and on the plateaux margins overlooking it, the soils are mainly of residual type, and are well suited to the growing of tobacco.

**4. The Tectonic Development of the Rift Valley.**

At the close of Karroo times several patches of Karroo sediments were faulted down into the crystalline rocks of our area, and subsequently the whole region underwent extensive planation. The disposition and character of the Dinosaur Beds indicates that at the beginning of Cretaceous times, however, or even earlier, a depression began to form on the site of the northern end of the Nyasan Rift Valley. Moreover, a glance at a topographical map of this part of Africa shows that the larger rivers of the country west of the northern part of lake Nyasa flow for a time away from the lake and then parallel with it for the greater part of their course, while those to the east first flow westwards, then parallel with the lake, and finally maintain a steady course eastwards to the sea (see Fig. 1). Nevertheless, as pointed out by Andrew and Bailey (I., p. 235), the rivers in the country lying west of the southern end of the lake have persisted in an easterly course, and in so doing they have cut their way through a range of hills of considerable height before descending to the lake; these authors consider that these rivers are but the heads of other larger rivers that were able to maintain their courses across a rising ridge until they were finally intercepted by the Rift Valley. Similarly, the ancient east-west river now represented by the lower part of the South Rukuru and of the Ruhuhu, was for a time able to maintain its course across the earlier earth-movements of the Rift Valley system until it also was finally intercepted by the faulting that followed (II., p. 306); it is evident, however, that at least the more important tributaries and possibly also part of the course of the main river itself, were forced to conform to the north and south folding to a greater or less degree. These observations, in conjunction with the greater intensity of the Rift Valley movements at the northern end of Lake Nyasa than in the south, may be interpreted as showing that the anticlinorial ridges of the north grew so rapidly that, in general, the drainage of the area was at length forced into parallelism with them, whereas those of the south, in an area of more gentle movements, developed only at such a rate that the rivers there were able to maintain their established courses across them. This super-position of a north-south drainage upon an east-west drainage

is in accord with earlier observations from other parts of East and Central Africa (II., p. 376).

It is probable, therefore, that the whole region was gently uplifted at this time along a meridional line, and also, following Professor Gregory's hypothesis, that this movement was succeeded in Oligocene time by subsidence, in the form of rift-faulting, as a result of the development of tensional stresses; in a later paragraph further evidence will be adduced in support of this view. In tracing the series of events that ensued, interest centres first upon the North Nyasa area and then upon the country traversed by the Shire Valley, and in the first of these areas the study of the Lacustrine Series of sediments has yielded the requisite data for the following tectonic sequence:

The Dinosaur Beds were tilted, eroded, and then overlain by the red conglomerate that forms the first division of the Lacustrine Series; further tilting and erosion, as well as faulting, took place before the succeeding shelly limestones of Pliocene age were laid down, and so on for the third and fourth divisions of the Series; towards the end of the Series there arose the volcanic accumulations of the Songwe River. Subsequently faulting and erosion of the volcanic beds took place, after which the level of the lake fell several hundred feet, and as the waters receded a layer of coarse pebbly gravel was spread out over the lake plains. It is important to observe not only that the tilting almost invariably occurred in the one direction, *i.e.* E.N.E. towards the foot of the Livingstone Mountains, but also that similar movements took place in several subsidiary rifts running parallel with the main rift. Moreover, the faulting on the E.N.E. side of the rift took place, over a long period, more or less along the same line, and thus gave rise to the present magnificent Livingstone scarp; on the other hand, the faulting on the opposite side was always less in amount and ran along parallel lines that advanced more and more towards the deepest part of the rift.

It will be clear that during the deposition of the Lacustrine Series lake Nyasa must have varied considerably both in depth and in area, and at some periods it certainly extended not less than 12 miles W.S.W. of its present limits. There is reason to believe, however, that during all this time it was more or less confined within the northern part of the present lake basin, *i.e.* within that relatively small section that runs north-north-westwards from Florence Bay.

It has already been observed that lake Nyasa becomes deeper and deeper as followed from south to north, and the evidence of the sediments of the northern end very strongly suggests that this relation has been maintained almost from the inception of the Nyasan Rift Valley; furthermore, these sediments show that the lake, or lakes, have diminished in width from time to time and have extended lengthwise far down the rift valley.

The difficulty of explaining what became of the barrier that formerly

held up the lake to many hundreds of feet above its present level has long been recognized; warping (I., p. 224) and faulting (II., p. 302) have both been suggested, but it has not been possible to indicate precisely how

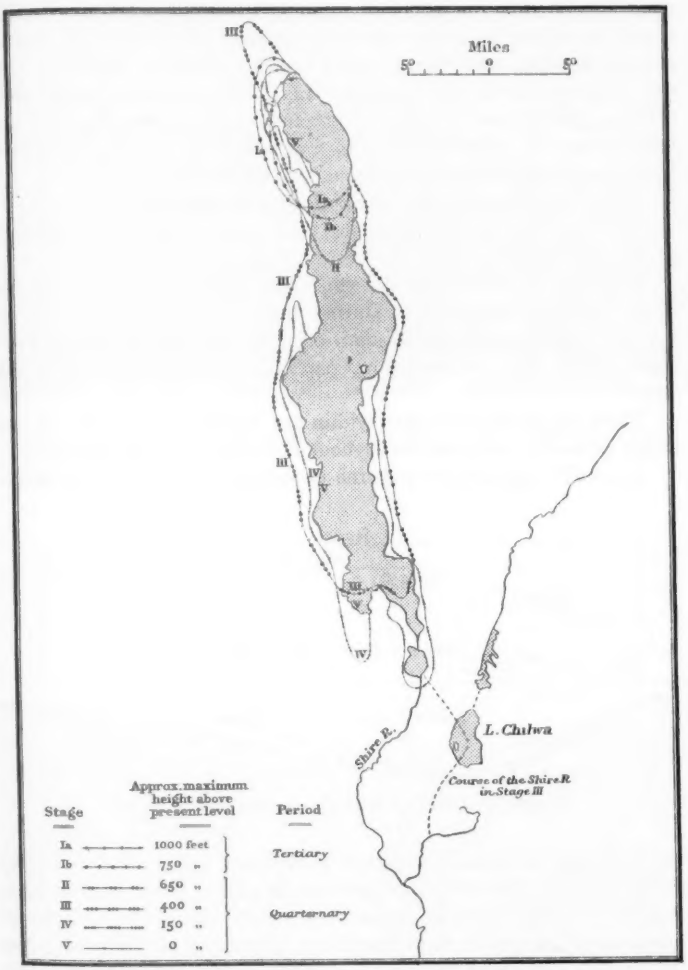



*Figure 4. Changes in the form of lake Nyasa.*

the change was brought about. It is now proposed to adduce evidence to show by what principal stages the lake-level has been carried down through a vertical distance of not less than 1000 feet; briefly, the level

of the lake has been lowered, and its southern limit carried farther and farther down the rift valley directly as a consequence of the intermittent subsidence of the floor of the rift.*

The different stages outlined in the following paragraphs represent what appear to be the principal events in the evolution of lake Nyasa; it will be evident, however, that in the present state of our information it is not possible either to trace these events in detail or to indicate fully the complexity of the various movements. The accompanying diagrams (Figs. 4 and 5) may be regarded, therefore, as representing only in a general way the variations in form that lake Nyasa is believed to have undergone in the course of its long and varied history.

*Stage I.*—This stage may be regarded as comprising

(1) Stage I*a*, during which the lake stood at 1000 feet above its present level and laid down the lower red conglomerate; and

(2) Stage I*b*, during which it stood at a height of 750 feet and laid down the shelly limestones. During these periods the lake does not appear to have extended far south of Deep Bay, but it reached much further west than it does now, particularly during the earlier substage.

These events all took place within the Tertiary period, but the later stages probably continued throughout Pleistocene and Recent times.

*Stage II.*—Subsequently to the deposition of the shelly limestones,

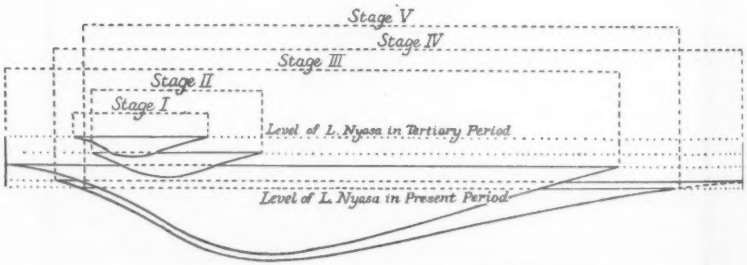



*Figure 5. Level of lake Nyasa at various stages.*

the faulting of the tract immediately to the south was maintained along a north-and-south line, and there gave rise to a tilt opposite in direction to that of the north. In due course these movements led to a southward extension of the area of deposition of the next group of sediments (upper red gravel), and about this time the volcanic tuffs of the Songwe River

* J. E. S. Moore advanced the hypothesis that in the course of time lake Nyasa extended more and more in a northerly direction (see 'The Tanganyika Problem' (London, 1903), pp. 71–74); this hypothesis has no bearing upon the present discussion, however, since it refers only to the superposition of the Rift Valley lake upon the site of marine sedimentation in Karroo times.

*Looking across the Lujiri and Ruo gorges to the southern scarp of the Mlanje Mountains*

*Tertiary lacustrine strata faulted against a crystalline ridge, Luketa, North Nyasa*

*The Mlanje Mountains* (9000 *feet*)

*The dry bed of the Chisali River, North Nyasa, cut through a hard crystalline ridge*

*Pliocene limestones capped by hard red conglomerate, near Chisali*

were laid down. These events left the lake standing at about 650 feet above its present level, as shown by the disposition of the upper red gravel, and extending southwards for some miles beyond the mouth of the South Rukuru River. As the level of the lake fell during the succeeding stages, the rivers of the north-western coastal plain began and subsequently continued their work of incising deep narrow gorges through the transverse ridges, referred to in an earlier paragraph, that intervene between the parallel troughs occupied by the softer sediments.

It should be mentioned that both in this and in the later stages the faulting in any one area was not necessarily accomplished along one line or in one movement.

*Stage III.*—On the completion of Stage II. subsequent down-faulting of the floor of the rift enabled the lake to extend southwards practically as far as its present limit; but southwards of Nkata Bay it was then considerably wider, so that in the Domira Bay area, for example, its western shore-line was about 20 miles west of the present one. The lake then stood about 400 feet above the modern level, and its outlet, instead of following the whole course of the Shire Rift Valley, left this valley north-east of Liwonde and followed an eastern detour by way of lake Chilwa, Tuchila Plain, and the Ruo Valley. The evidence for this stage rests principally upon (1) the distribution, up to a height of about 400 feet, of coarse, incoherent, pebbly gravel over the north-western lake plain and of thin pebbly gravel at many places over the lake plains farther south; and (2) the existence of Makongwa Scarp, that overlooks the Upper Shire River from a height of about 400 feet, and forms the north-western edge of the lake Chilwa plain (see Fig. 3).

This stage occupied a considerable duration of time, because during it the lake outlet and its tributaries of that period were able to plane off wide valley plains comparable with those of the modern Shire valley, and to bring the floors of several intersecting rifts into complete accordance; moreover, the wide rock platforms now seen to slope gently towards the lake around the southern end were produced during this stage by the combined effects of lake and river erosion and of weathering.

It has already been seen that overlooking the Stage III. river course that runs along the western foot of the Mlanje massif there are several platforms of erosion ranging from a few hundred to 4000 feet in height; these platforms, although doubtless due to faulting in the first instance, belong to pauses that were sufficiently long for complete accordance to develop between them and the valleys with which they communicated. It is regarded as probable that the younger of these platforms are related to those earlier stages in the development of the Rift Valley during which lake Nyasa stood at 700 to 1000 feet above its present level. The older and higher platforms, on the other hand, such as those upon which are developed the bauxite deposits of the Mlanje mountains (VIII.) and of

Zomba Plateaux, are of much greater age, and they probably belong to a very early period in the history of the Rift Valley.

Subsequently to the initiation of Stage IV., no great change has taken place in the form of the old river course beyond a slight warping that was apparently unaccompanied by faulting; this warping has resulted in the formation of the broad shallow depression in which lake Chilwa now lies, and possibly also it led to the former connection of this lake with the head of the Lujenda River. At the time the outlet from lake Chilwa communicated with the Lujenda, the waters of the lake covered a much larger area than they do now; moreover, they were fresh, and they carried a fauna identical with that of lake Nyasa. When the lake was deprived of its outlet, however, the waters became more or less saline in consequence of evaporation, and as a result practically all the representatives of the former fresh-water fauna were killed off, except in those "fresh-water oases" that exist on the lake margin where the larger streams run into it; the fossil remains of this earlier fresh-water fauna, as well as the bones of contemporary hippopotamus and elephant, are now preserved in the old lacustrine deposits that extend for many miles around the shores of the modern brackish lake.*

*Stage IV.*—The beginning of Stage IV. was marked by the development of renewed faulting along the line of the Shire Rift Valley; this resulted in the intersection of the old drainage course running past the foot of the Mlanje Mountains by the Makongwa fault-scarp, and in the lowering of the level of lake Nyasa by another 250 feet. To this stage may be assigned (1) the lowest extensive lake plain, which is made up of fine sediments that, at the northern end of the lake, wrap around all the older lacustrine deposits up to a height of slightly more than 150 feet above lake-level; and (2) certain truncated valley plains that are tributary to the Upper Shire Valley and stand about 250 feet above its floor. The erosion of these valley plains, of which that one traversed by the Lisanjala River (VII., p. 7) may be quoted as an example, indicates an appreciable lapse of time, because they are carved into the crystalline rocks of the area and are fully accordant with the corresponding plain of the Shire River; nevertheless, they are probably slightly older than the movements that lowered the lake to the 150-foot level.

*Stage V.*—During this stage, by the renewal of intermittent faulting similar to that of Stage IV., the lake was brought down more or less to its present level and withdrawn to its present limits. The youngest lake beaches standing about 15 and 25 feet above lake-level were formed at this time, and doubtless the alluvial terraces of the Upper Shire River and its tributaries (VII., p. 9) are closely related to these beaches.

The faulting that took place during Stages IV. and V. tilted the broad valley-plains of the different periods in various directions, with the result that the courses of the Shire River and its tributaries were much

* See J. E. S. Moore, 'The Tanganyika Problem' (London, 1903), pp. 22, 58.

modified from time to time; sometimes they ran over aggradation plains built up in the different fault angles, and at other times they ran along the foot of developing fault-scarps or entrenched themselves in their former beds (VII., p. 5). Moreover, the floor of the Middle Shire Valley as a whole was tilted downstream through a total vertical distance of about 1200 feet, with the result that the Shire River was obliged to cut deep into its rocky bed and thus to give rise to the Murchison Cataracts.

It will be evident that the last phases of the faulting of the Rift Valley must have extended into Recent geological time, and the presence of lines of hot springs along the youngest faults and the frequent occurrence of earth tremors within the rift indicate that the activities connected with the formation of the Rift Valley have not yet entirely subsided in this area. The following examples of these hot springs may be taken as typical of those occurring in Nyasaland: (1) Mwankenje, Karonga; (2) Mpizi, at foot of Mount Waller; (3) several miles north of Nkata Bay; (4) several miles south of Kazando; (5) Kota Kota; (6) Liwonde; and (7) Mwendamgombe, Lisungwe River; moreover, additional hot springs are known much farther south along the line of the rift at the foot of Marambala Mountain.

Finally, it may be mentioned that a few stone implements representing a palæolithic stage of culture have recently been found on the 15-foot raised beach in North Nyasa and on river terraces of various heights on the floor of the Rift Valley (IV., p. 7); while it would as yet be inadvisable to attach too great a weight to these finds, it may at least be inferred that man did not reach this part of the Great Rift Valley until after it had assumed its present general form.

Before proceeding to a description of certain changes in lake Nyasa within historic times, it may perhaps be desirable to refer to the bearing that the foregoing observations appear to have upon the general question of the origin of rift valleys. It is believed by the writer that the results of the present investigation strongly suggest that at least the later and more important movements giving rise to the Nyasan Rift Valley and associated fractures were controlled by forces due to regional tension rather than to compression,* and the reasons for this belief may be briefly summarized as follows:

(1) The absence of thrusts, folds, and other evidences of compression, combined with the development of much block faulting.

(2) The occurrence of subsidiary rifts parallel with the main rift and, particularly in the neighbourhood of the Shire River, the existence of a reticulated system of rift valleys.

* See E. J. Wayland, "Some Account of the Geology of the Lake Albert Rift Valley," *Geogr. Journ.*, Nov. 1921, pp. 344–359. In this paper Mr. Wayland advances the view that the earlier major Rift Valley faults are due to overthrusting consequent upon lateral pressure resulting from the subsidence of the floor of the Indian Ocean.

(3) The presence of low, broad fault-steps, extending far out towards the middle of the rift valley floor, in addition to the relatively high, narrow fault-steps ranged along the main walls of the rift.

(4) The successive tilting of the floor of the northern end of the rift in the one direction, and the repetition of this structure in contemporaneous parallel rifts.

In view of these observations it is tempting to inquire how far the formation of other parts of the Great Rift Valley may also have been determined by similar forces, even where the evidence for their action is less easily observable.

**5. Lake Nyasa and the Shire River.**

It has already been seen that the level of lake Nyasa has varied greatly within late geological times, and it might therefore be of interest to refer briefly to the changes that have been observed within the historic period not only in the lake itself but also in its outlet, the Shire River. As in the case of the other Central African lakes, Victoria and Albert,* the level of lake Nyasa has been shown to rise and fall, in sympathy with the sun-spot numbers, with an eleven-year periodicity (VI.), and this varying level appears to have had a marked effect upon the activity of the Shire River (VII., p. 9). Until 1910 the river formed a highway of great importance in Nyasaland, but owing to the succeeding minimum level reached by the lake, combined with a certain amount of silting up and the growth of vegetation, the river has since become unfit for navigation, Early in 1923 it was suggested that if, as there was reason to suppose, the level of the lake should continue to rise for several years, then it was possible that the river would be given a new lease of life, whereby it would be able more or less completely to scour out its old channel again. Up to the present time these changes appear to be taking place; the lake has continued to rise, the volume of water in the river has increased, and during the last two rainy seasons (1925 and 1926) severe floods have occurred in the Shire Valley, with the result that several bridges have been wholly destroyed; moreover, during the first of these seasons lake Malombe, which had been drying up for several years and was completely dry in the preceding dry season, suddenly became flooded, and then remained as a lake, after the lapse of many years, until the next rains began.

In conclusion, it may be mentioned that an appreciation of the form of both the Nyasan Rift Valley and the Shire Valley is of considerable importance in connection with the various railway routes to lake Nyasa that have been proposed within recent years (VII., p. 11). Even with regard to the later proposals for linking up lake Nyasa with the existing

* C. E. P. Brooks, "Variations in the Levels of Central African Lakes Victoria and Albert," Geographical Memoir No. 20 (Meteorological Office), 1923.

Tanganyika Railway,* the structure and geology of the Rift Valley have necessarily, although perhaps unconsciously, been taken into account. For example, the route to Manda appeared at first to offer the only practicable course on this side of the lake, and it was rendered possible simply because the normally steep sides of the rift had here been modified by the existence of a large outcrop of Karroo sediments, which were of sufficiently low resistance to have been scooped out into a valley of moderate gradient leading down to the lake. To find another route of practicable gradient it was necessary to go a long distance farther north up the Rift Valley, both to avoid the mighty scarp of the Livingstone Mountains and also to enter a north-easterly branch of the rift, which could then be followed down to the main rift and thus to the northern end of lake Nyasa. Moreover, with regard to all other new or little-known territories, it is in general of the greatest practical importance to obtain adequate physiographical and geological data as soon as the broader questions of transport begin to come up for consideration.


I. A. R. ANDREW and T. E. G. BAILEY: "Geology of Nyasaland," *Q.J.G.S.*, 1910, p. 189.

II. J. W. GREGORY: "The Rift Valleys and Geology of East Africa," London, 1921.

III. F. DIXEY: 'Ann. Rep. Geol. Surv. Nyasaland,' 1923.

IV. „ 'Ann. Rep. Geol. Surv. Nyasaland,' 1924.

V. „ 'Ann. Rep. Geol. Surv. Nyasaland,' 1925.

VI. „ "Lake Level in Relation to Rainfall and Sunspots. Variations in the Level of Lake Nyasa," *Nature*, vol. 114, 1924, pp. 659–661.

VII. „ "The Physiography of the Shire Valley and its Relation to Soils, Water Supply and Transport Routes," 'Rep. Geol. Surv. Nyasaland,' 1925.

VIII. „ "Bauxite Deposits in Nyasaland," *Mining Mag.*, October 1925, pp. 201–205.

IX. „ "The Sumbu Coal Area, Lower Shire, Nyasaland," *Mining Mag.*, March 1926, pp. 148–157.

X. „ "The Geology and Mineral Resources of Nyasaland," *Mining Mag.*, April 1926, pp. 201–212.


Before the paper the PRESIDENT (Dr. D. G. HOGARTH) said: We are assembled this afternoon to hear Dr. Dixey speak to us with regard to that extraordinarily interesting part of the world, the Great Rift Valley, which the Lakes of Tanganyika and Nyasa partially fill. Always interesting from the scientific point of view, it is now particularly interesting territory, as it is entirely under British administration. I call upon Dr. Dixey to address us.

*Dr. Dixey then read the paper printed above, and a discussion followed.*

The PRESIDENT: Sir Sidney Harmer is present. Would he like to add anything?

Sir SIDNEY HARMER: I am not a geologist, and there are several others

* A. G. Church, "The Inter-relations of East African Territories," *Geogr. Journ.*, 67, 1926, p. 213.

who are better qualified to speak than I am. I will merely content myself by congratulating Dr. Dixey on the valuable results he has obtained.

Sir ALFRED SHARPE (ex-Governor of Nyasaland): I have listened with very great pleasure to Dr. Dixey's lecture, because I know the country and I also know the excellent work he has done in other directions in Nyasaland during the time he has been there. He has spoken from the geological point of view; that is to say, he has dealt with geological periods. I should like to have heard a few words more from him on the question of the present change in the levels of Lake Nyasa. That is a most important point so far as transport in Nyasaland is concerned. When I first saw Lake Nyasa in 1887 there was a fine broad river, the Upper Shire, running from the southern end of the lake and navigable as far as Matope—about 50 miles. In 1880 and in the early '90's I went up into the lake in a screw steamer drawing 6 feet of water. In the early '90's the level of the lake began to get lower, and by 1900 it was very noticeable that there was less and less water in the Upper Shire River. This went on till, when I left the country in about 1910, navigation was no longer possible on the Upper Shire; the outlet had actually closed up. I was there again in 1912, and it was not only entirely closed, but grown up with vegetation, which very quickly takes root—reeds, and the floating cabbage plant, sud. There was a block at the exit of the Shire River. When I was there two or three years ago the lake was again rising, and it appears as if Lake Nyasa and Lake Tanganyika must have periods—cycles of what duration I cannot say—of high level and low level. I am glad to hear from Dr. Dixey that when he left the country the lake was apparently still rising, and it appears to me that if it goes on rising the time will come when it will break through and navigation will again be possible on the Upper Shire River. You saw some photographs showing the condition the river is in now, full of vegetation, and I am afraid when it does break through there will be some havoc done in the Lower Shire Valley. I should like Dr. Dixey to have given us some idea as to what causes those cycles of high and low level.

Mr. A. E. KITSON: I should like to congratulate Dr. Dixey on the very useful work he has done in Nyasaland and on the important results obtained, especially with regard to his determinations of successive stages showing progressive enlargement of Lake Nyasa by repeated founderings of the region, and also the later oscillations of lake-level due to climatic conditions.

The PRESIDENT: Would any one else like to join in the discussion, either from the geological or economic standpoint? If not, I will ask Dr. Dixey to say a few words in reply, and perhaps he would inform us on a point which I think geographers would be interested in raising. I got the impression of a very sparsely inhabited country. That might have been the fault of the photographs. I wondered what the economic future of railways in that country might be.

Dr. F. DIXEY: The photographs would perhaps give an incorrect impression as regards the population of Nyasaland as a whole. It so happens that the areas which have most bearing upon the subject of the paper are thinly populated. The country along the north-western shores of the lake is sparsely populated because of the conditions I tried to emphasize by the slides; it is country made up more or less of great gravel slopes that are thoroughly dry, with practically no soil and no water, and consequently but very few people are able to exist there; these people are confined not merely to the banks of the streams but to the water-holes that occur here and there in the dry stream courses.

As for the Mlanje Mountains, they are completely uninhabited at the higher levels. When I was there there was not a hut of any kind. Both the native and the European plantations lay around the foot of the main mass; the plateau cottages that stand 4000 feet above the plantations are the only signs of habitation. But in Nyasaland as a whole and in other parts of the Rift Valley that are not so important from the point of view of structure there are, for that part of Africa, quite dense populations. The most important areas in that respect are the Upper and Lower Shire Valleys, where, as you will perhaps remember seeing on the map of the Shire Valley, wide alluvial plains occur. On these plains there is quite a fair native population, and the more important cotton areas of Nyasaland are situated upon them. The high plateaux overlooking the lake are often satisfactorily populated, but naturally within the Rift on the more rocky floors and on the steep slopes there are very few people, because the soil is thin and poor and water-supply conditions are bad.

Referring to Sir Alfred Sharpe's point, I would like to mention that with regard to the wider variations in the level of Lake Nyasa the matter stands as follows: the question was first referred to me rather more than three years ago, and it was then assumed that the level of the lake was falling, and that consequently it would be perfectly safe to erect buildings and other works on the lake-shore. I found, however, that the lake had already commenced to rise, and accordingly I made an examination of all available records. Although there was no continuous record available I found that Captain E. L. Rhoades, who had been connected with the lake for many years, had kept a continuous record of the lake-levels at Nkata Bay from 1894 to 1914. Also the Marine Transport Department had kept a continuous record at the Bar, Fort Johnston, from 1916 onwards, and at Monkey Bay it was found possible to link these two series of records together. In that way it has been possible to prepare a continuous record of the lake for some thirty years. When these records were plotted it was found that during this time the lake rose and fell, and that the maximum levels recurred at intervals of about eleven years. A similar result is of course well known to occur in the case of the other Central African lakes, Victoria and Albert, which had previously been investigated by Mr. C. E. P. Brooks. Accordingly, in 1923 the lake was rising, and following up these observations there is reason to suppose that the lake will continue to rise, which, as Sir Alfred Sharpe has pointed out, is a matter of great importance. Whatever may be one's views as to the relation between lake-level, rainfall, and sun spots, the theory has justified itself here to a great extent, and events are happening just as was anticipated on that basis.

As regards the earlier history, navigation was carried on, as Sir Alfred Sharpe mentioned, more or less continuously until about 1910. At that time the lake was falling, and it reached the lowest depth on record about 1913 or 1914. It was so low then that the Shire River practically ceased to flow. Nevertheless, the tributaries during the rains brought down a great deal of detritus and piled it up on the river-bed, which became raised so much that the succeeding rise was scarcely sufficient to sweep the detritus away. We are now approaching the next maximum, and the lake is higher now than it has been for many years. The last two rainy seasons have seen a great change in the Shire Valley and in the Shire River. The river has completely swept away bridges that were thought to be quite safe; it has strewn the alluvial plain with detritus, and it is even now still rising. While the rise may not yet be sufficient to re-establish the river completely, it shows that conditions are on

the up-grade, and that the river is more or less returning to its earlier state. We have a striking example of the recent changes in the case of Lake Malombe. Two years ago the lake was completely dry at the end of the dry season; I walked right across it and it was not even swampy. But from the head of the lake right up to Lake Nyasa there was a continuous stretch of water, and as far as one could judge the water in the river stood above the floor of Lake Malombe; it was held up by what in navigation times was known as the Nelicoli Bar. It appeared that if Lake Nyasa rose just a little more, just sufficient to overtop that bar, then Malombe would be flooded and would become a lake once more. Within two or three months the rainy season began, and the lake rose more and more until it overflowed that barrier, and since then Lake Malombe, after many years, has been fully re-established. If the view as to the periodical variation of the lake-level is correct, the lake will continue to rise for another one or two years.

The older lacustrine deposits are known only at the northern end of Lake Nyasa, and the southward extension of the lake is proved by the successive deposition of the younger deposits farther and farther in this direction.

In conclusion, I would like to express my thanks for the very appreciative remarks made by the different speakers, as well as for the manner in which the paper has been received.

The PRESIDENT: I hope Dr. Dixey will accept our best thanks for a very able and clear discourse upon a subject which has obviously many aspects, and very considerable and different interests—such as the question of the rise of level of the lake and the economic consequences which may follow its variations, the question of railways and population, and that other question which no one has touched upon, namely, the dinosaur bone deposits. However, that will perhaps come up again early in the next session, when we hope to hear something about dinosaur deposits in another continent. I am sure you will express your thanks to Dr. Dixey in the usual way.

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## PHOTOGRAPHY ON THE HAMILTON RICE EXPEDITION, 1924–25

*From the Report prepared at the direction of Dr. Hamilton Rice for Major-General Mason M. Patrick, Chief of Air Service, U.S. Army, by Capt. A. W. Stevens, U.S. Air Service.*

EQUIPMENT.—The Hamilton Rice Expedition brought from the United States the following apparatus:

1 Fairchild Aerial Camera, 12-inch focus, same as U.S. Air Service model K-3. Complete with extra magazine, mount, and carrying cases.

1 Fairchild Aerial Camera, 20-inch focus, same as U.S. Air Service model K-6 for oblique photography. Complete with view-finder and 3 filters, × 12 Minus Blue, K-3, and Aero 1; 16 rolls of Eastman Hypersensitized Panchromatic Aerial Film.

1 Bell & Howell Motion Picture camera and tripod; lenses, 2 inch, 3 inch and 6 inch.

1 Graflex Camera, $3\frac{1}{4} \times 4\frac{1}{4}$ inches, revolving back, long focus, with

*Hinton and Stevens outside photographic tent, Boa Vista*

*Stevens developing aerial film at Boa Vista*

*Hinton and Silvino Santes at Boa Esperança*

*Photographic tent and drying frame*

plate, cut film, and roll film holders. Lens, convertible anastigmat, 6½ inch and 11 inch.

1 Kodak, 3¼ × 5½ inches, using roll film.

1 View Camera, 5 × 7 inches, using plates. Lens, convertible, 7 inch and 12 inch.

1 Eastman Kodak Co. Developing Machine for Aerial Film, complete with tanks, assortment of trays, and chemicals; printing frame, scales, thermometers, timing clock, Velox and Azo printing paper, etc.

**Filters.**—The same ray filters used on the 20-inch camera were used on the 12-inch camera, by fitting a bayonet socket at the end of the 12-inch cone. This saved having a duplicate set of filters, and worked perfectly. For vertical photographs the K-3 filter was used most, from the comparatively low altitude of 6200 feet. At higher altitudes the × 12 would have been necessary. All three filters were used for oblique photography, depending on the distance of the subject to be photographed. For extremely distant views the × 12 is used; for medium distance the K-3; for objects comparatively close, the Aero 1. On cloudy days, or in very early morning or late evening, the lens was used without a filter.

**Sensitized Materials.**—No trouble was experienced in using any of the photographic materials in this climate. The absence of ice made it necessary to carry out all operations at the prevailing river temperatures, which varied between 80° and 85° F. Standard chemicals, of the kind regularly purchased by the U.S. Air Service, were used, and although special chemicals, such as formaldehyde, were brought along, it was unnecessary to use them.

**Development.**—All the development work was done at night, in a tent provided for the purpose, or in a thatched shelter covered with a canvas tarpaulin. At first the water for the solution was set out in discarded gasoline tins and other basins to cool as evening came, and work was started at 3.00 a.m. When daylight came the film was ready for hanging up to dry. Water left in the open at night will cool about 5° below river temperature. As work progressed it was found that it could be carried out nearly as well immediately after nightfall, at river temperature. Hand electric flash lamps and kerosene lanterns were used when light was needed. Tropical moonlight is often very bright, and although the tent openings were carefully closed, it was often light enough inside the tent to make out the silhouettes of all objects plainly. The canvas was of the copper-treated, mildew-proof kind, and exercised a filter action, insomuch that the light admitted was a very pale green; tests showed that moonlight, filtered through the tent, had no appreciable fogging action on ordinary plates or film. With the panchromatic film no chances were taken, and work was carried on either before moonrise or after the moon had gone down.

**Aerial Film.**—The Aerial Panchromatic Film, hypersensitized, kept

surprisingly well, to work free from fog as late as April 1925, or eleven months after manufacture; it had been at 85° F. most of this time. It is important, if film cannot be kept cool, that it be kept at least at a uniform temperature, and particularly that the tin, or even the outer cardboard container, be not exposed to the direct heat of the sun. If the package gets hot, the film deteriorates at once. This applies to all photographic sensitized materials; aerial film, Kodak film, dry plates, and paper. If they cannot be kept cool, at least they must be kept from a temperature higher than that normal to the country.

**Sensitized Paper.**—No trouble was experienced with either Velox or Azo paper. Velox prints worked clean and white on the margins, with good blacks in the shadows. These prints underwent ferrotyping successfully and did not stick to the ferrotype plates. Velox has one peculiarity that often causes it to be condemned by workers who are not fully acquainted with it. In damp climates this paper absorbs a certain amount of moisture from the air, and it is apt to absorb it unequally or in patches. When immersed in a normal developer, the surface of the print repels the solution in spots, much as if it were oiled, and the developed print then shows white streaks all over its surface. The remedy is very simple indeed: double the strength of the developer, that is, add less water to the stock solution; or, add several spoonsful of sodium carbonate, either crystals or powder, to the normal developer. In either case the increased alkalinity of solution will ensure even development, and the trouble from white streaks will cease.

**Developer for Aerial Film.**—Pyrogallic acid was used for developing the aerial film. Pyro is acknowledged to be the best developing agent for negatives; it is more messy and does not keep as well as other developers, but it produces negatives of the finest quality, and moreover develops with a minimum of chemical, which is a very important consideration. Furthermore, it is a comparatively inexpensive chemical, and a tank of developer used for one or two aerial rolls may be thrown away without great loss. Freshly mixed developer makes for more uniform results than a tank of better-keeping developer that is used over a long period of time, for a certain amount of bromide enters the developer with each batch of film treated, and this affects the character of the developer.

When aerial film was developed, it was usual to develop it and plates or small film on hand in the same tank of solution. If there was no aerial film to develop, and work on the smaller sizes was necessary, it was customary to use a diluted Metol Hydroquinone developer, in trays. Paper was always developed in the M.H. developer, in trays. The Pyro developer should be used only while it is fresh, within an hour, or at most a few hours, after mixing. If it has scum on it, this must be brushed or floated off before using. If the scum sheet is very thin, a vigorous stirring will suffice.

**Rinsing Film.**—If possible, film and paper should be rinsed between developing bath and fixing bath. In the case of aerial film, it was customary to dip the reel in a tank of clean water, moving it up and down for half a minute, then to transfer it to a second tank of clean water, to be moved up and down for half a minute, and then to the fixing bath. For paper and for small negatives, it was customary to have the rinse water acidulated with 3 ozs. acetic acid of 28 per cent. strength, or 1 oz. of the 99 per cent. glacial acetic per gallon of water. This stops development instantly, and ensures to a large extent that all developer has its alkaline content thoroughly neutralized before the print or film enters the fixing bath. A fixing bath which becomes alkaline is very bad, especially where the solution is warm ; dichroic fog and stain may result—impossible to remove afterwards. In tropical development it is important that the fixing bath be always acid in reaction, that it have more than the customary amount of acid hardener, and that it be renewed frequently. The acid short stop for rinsing is an insurance that the acid hardener of the fixing bath does not get neutralized.

**Fixing Bath.**—For the large tanks we used 40 lbs. of hypo to 20 gallons of water. A freshly made-up hypo bath is considerably lower in temperature, due to the passing of the crystals into solution. While a slightly cool hypo bath is desirable, it should be remembered that the emulsion on film or paper, when taken from a very cold hypo solution to warm wash water, is apt to break loose from its supporting base. Solutions should not differ more than a few degrees in temperature.

**Hardener.**—One pint, or 16 fluid ozs., of the following hardener, is added to each gallon of the hypo fixing bath :

| | | |
|---|---|---|
| | Sodium sulphite, dry .. .. .. | 1 lb. |
| | Glacial acetic acid, 99 per cent. .. | 14 fluid ozs. |
| or | Acetic acid, 28 per cent. .. .. | 48 „ |
| | Potassium alum, white .. .. | 1 lb. |
| | Water, to make .. .. .. | 1 gallon. |

The above solution is slightly yellow when first mixed, but becomes quite colourless ; if it is milky in appearance, it is evidence that the chemicals have been mixed in the wrong order. When added to the hypo solution, the combined solution should still be colourless. If there is much vegetable matter in the river water used, as is apt to be the case in the tropics, the alum will coagulate the slime, carrying down suspended particles ; there is then apt to be half an inch of moss-like flocculent stuff at the bottom of the large fixing tank. This does no particular harm if not stirred up ; it is better to remove it by bailing off the top liquid into an enamelled bucket. Pour back the top liquid, add the top of the solution in the bucket after allowing it to settle, and throw away the residue.

If film shows any sign of reticulation, it is evident that not enough hardener has been added, and more should be put in the fixing bath than that indicated. The fixing bath should not be used when it becomes

frothy ; a new bath should be made up. Watch the fixing bath ; almost all hot-weather troubles come from an incorrect fixing bath.

Apparently the secret of developing film at the river temperatures that prevail in the Amazon Basin, 80° to 85°, is to develop reasonably quickly (not over four minutes) so that the gelatine will not have too much time to swell, and to fix in an acid bath that has enough hardening agent to shrink the gelatine of the emulsion to a hard surface.

**Purification of Water.**—River water in the Amazon Basin is quite free from inorganic salts, such as lime ; for washing it is what is commonly termed " soft " water, producing a lather freely with soap. It contains considerable vegetable matter, some yellow mud, and some sand in suspension. If given one or two hours to settle, much of the mud and sand will be found at the bottom of the container, and some of the vegetable matter is carried down at the same time. The handiest scheme for getting fairly clean water, therefore, was to bring it from the river in ordinary 5-gallon gasoline or kerosene tins, the tops of which had been partially cut out to faciliate filling and emptying ; these cans were allowed to settle for at least two hours and preferably five, being filled just before sunset. When to be used, some 4½ gallons was carefully poured off into tanks or trays and the remaining half-gallon thrown away. A secondary advantage of this method was that the cans quickly acquired night air temperature, and surface evaporation still further reduced the temperature. It was often possible to get water as cold as 79°, and very occasionally, if a night breeze was blowing, water as cold as 75°. The river water never ran over 85° where there was even a moderate current, and development at 82° to 85° offered no difficulties ; if the water could be brought to 79° or 75°, so much the better.

**Delay before Developing.**—It is important that all negatives be developed in the tropics as soon as possible after exposure. However this is often impossible, and steps are necessary to preserve the emulsion from moisture. In the case of aerial film, the best practice is to seal all the joints of the cover of the camera magazine to prevent circulation of air. One sealed exposed aerial magazine was unavoidably left at Vista Alegra (less than 2° off the equator) during fifty days of almost continuous rainfall, yet on development it showed no signs of deterioration. This magazine was sealed with Johnson & Johnson " ZO " adhesive tape, 1 inch wide ; this is very good tape and holds up well in the tropics ; when it is pulled off, the paint usually comes with it.

For Graflex and Kodak cameras it seems best to use roll film exclusively, to use the six exposure rolls, to finish exposing the roll the same day, and to reseal it with tape in the same tin container from which it was originally taken, before nightfall. As these hand cameras differ from aerial cameras in having leather bellows, a change of air takes place at each using ; consequently it does no good to attempt to seal the back of the camera. The small rolls will absorb little moisture where

a series of exposures are made within a few hours, and the film, when put back in its can, is in practically the same state of dryness as when packed at the factory. Thus resealed, it may be developed months afterward. It should be protected very carefully from direct heat rays until developed. For the smaller negatives, a special box, about the size of a kerosene case, was carried. This had a zinc case inside, with separate cover. The inside of the wooden box was lined with sheets of asbestos; the outside was covered with canvas, so arranged with flaps as to shed water. This box was rainproof, and to a very large extent sunproof.

Aerial film, not being required so often, was kept in its original sealed tins, inside its original cardboard box, and was wrapped in a blanket or other clothing, and kept well to the centre of duffle bags, kerosene cases, or other containers—the object always being to keep it from getting hot from the sun's direct rays during the daytime. Motion-picture film, received from New York in the hold of ocean-going steamships, was repacked at Manaos for up-river shipment; the sealed cylindrical tins, inside their cardboard boxes, were packed in rectangular tin cases, which were soldered tight. These tin cases were supported inside wooden cases in such a way that there was a clear air space of more than 1 inch all around; a few ventilating holes were cut in the outside box. Thus packed, there was little danger of the film getting hot, even if exposed for hours to sunlight on the open deck of a river steamer. River steamers distribute their freight all over the decks, particularly if it be comparatively light and bulky, and a shipment of film is very apt to be where the morning or afternoon sun, or even the mid-day sun, can strike it. Reshipped in launches, film stands a somewhat better chance; transferred to canoes, it is often covered with canvas or with native thatched toldas, or with grass mats. However, it may be the top unprotected box at any time, and the only safe way is to insulate it so far as possible against heat.

Where much work is to be done, it certainly will pay to take chemicals and trays as far as possible for the purpose of developing plates and small film, even if the trays and chemicals have to be abandoned when transportation becomes too difficult. In the meantime part of the film will have been developed, and will not then require special attention if in watertight cans, and a line will have been secured on correct exposure times for subjects, dark-skinned or light-skinned, in the open or in the woods. Motion-picture film, of course, cannot be developed in lengths, but small pieces cut off and developed serve to ensure that the instrument is working properly, and that the right shutter opening and diaphragm stop are being used.

**Developing and Drying.**—A canvas tarpaulin is thrown over the roots of a tree, or over a ridge pole erected for the purpose; two empty kerosene or gasoline cases, always available, are used for a table, and the fun begins! The negatives are put through several changes of water,

and then left until morning, being sure that they are completely immersed. If the fixing bath contains sufficient hardener—and this is the important feature—the negatives will not soften. It is useless to attempt to dry them at night—they will not dry. Moreover, in the dark the wet emulsion offers a tempting meal to ants, roaches, and other insects, and it may be found at daylight that patches of several square inches are perfectly bare of emulsion. After sunrise the negatives dry fairly fast, if suspended on clips on stout twine, where the morning breeze —there usually is *some* motion to the air—can strike them. This means, of course, that it is not advisable to do any developing if an early morning start in canoes is scheduled, but to wait until the party camps over a day. There will be no trouble from reticulation, from frilling, or from the emulsion running—if the fixing bath only contains enough ordinary hardener!

**Exposure Time.**—The fraction of a second necessary for full exposure is about the same as in the United States, notwithstanding the fact that the sun is more nearly overhead on the Rio Branco. It seems that the atmosphere, holding a large amount of water, filters out a certain proportion of the actinic light. Because of this filter action, the human body is protected from the shorter waves from the sun, and sunstroke is unknown in Central Brazil. Panchromatic film, highly sensitive to other colours besides blue, holds its speed wonderfully well throughout the day, and it is possible to get full exposures much earlier and much later than with ordinary film.

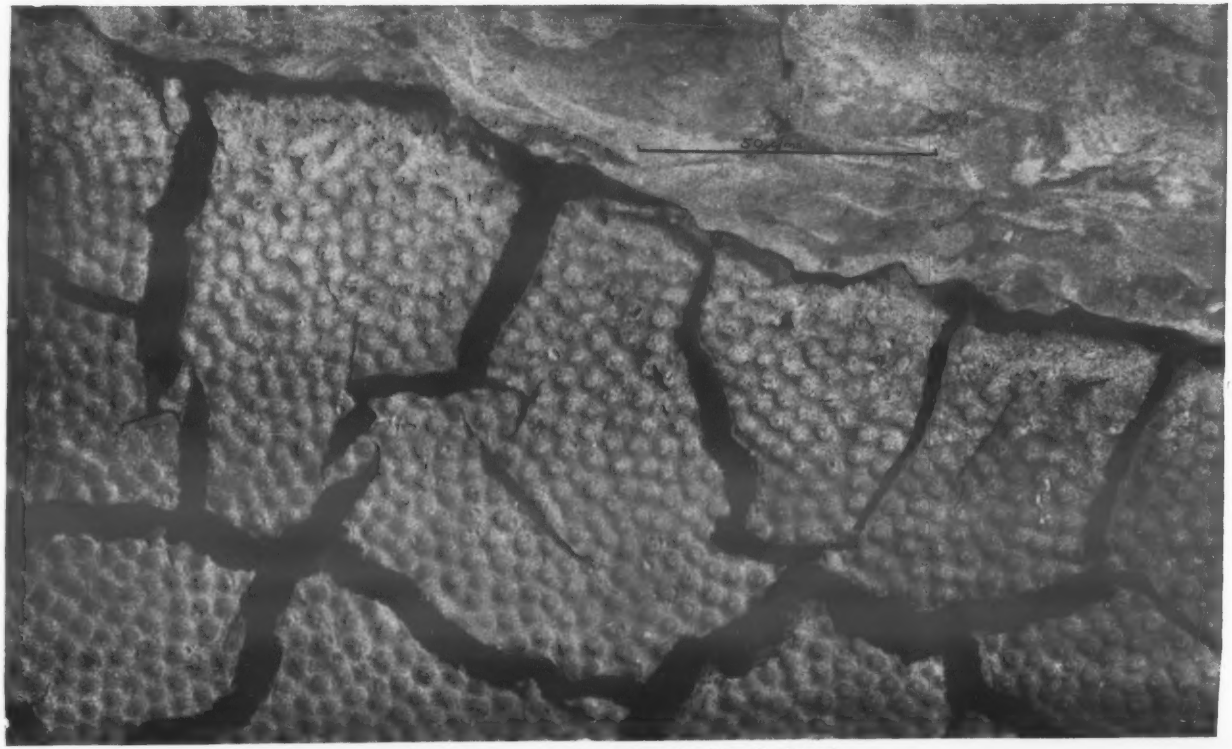
**Care of Cameras.**—If cameras are given the same attention that is ordinarily given to clothes, that will be quite enough. When clothing, during a rainy spell, is known to be getting damp, it is spread out for drying and airing on the first sunny day; half an hour or an hour on a black rock or ledge, under a fierce sun, will check any mould and dry it thoroughly. At the same time any instruments with leather and wooden parts, such as Kodaks and Graflex cameras, should be dried out. The backs should be removed, and the lens if possible, to let air circulate through; the leather parts should be wiped free of mould. Sometimes trouble is experienced with the reflex type camera with the mirror sticking from general swelling of the wooden box; thorough drying in the sun will usually make it operate all right again. A very little light oil on some of the working parts is advisable. Equal attention should be given the carrying cases to see that they are thoroughly dried out inside.

Aerial cameras, made almost entirely of metal, require practically no attention, especially if the magazines are sealed with tape.

On coming quickly down from the higher altitudes, it is often useless to attempt photography with aerial cameras, as the cold lens will condense water on its surface as soon as the warm moisture-laden lower layers of the atmosphere are reached. Going up, of course this difficulty does not exist.

*Stevens with Fairchild Aerial Camera and Maionggon Indians at Kujuma*

*Silvino Santes at Boa Esperança*



*Markings in mud at Ruafa, North Sinai*

In general, photography in the tropics offers no great difficulties and demands no special precautions, with the single exception that all sensitized materials must be kept in sealed moisture-proof tins, and must be kept from extremes of heat.

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## SOME CURIOUS MARKINGS IN MUD AT RUAFA, NORTH SINAI

T. Sutton Bowman

THE Wadi el Arish drains between one-third and one-quarter of the Peninsula of Sinai into the Mediterranean. This wadi is dry at ordinary seasons, but conveys *seils* (flood streams) during the infrequent and heavy rains which visit the region. At Ruafa, a waterhole some 35 miles south-east of the town of El Arish, the wadi passes through a narrow gorge in an outcrop of chalk with flints (of either Lower Eocene or Senonian age), and here the Turks had started to build a dam during the late war.

In the spring of 1924 there were exceptionally heavy rains in Northern Sinai, and the wadi ran in seil for three days, attaining such a volume and violence that the railway, which crosses its mouth near the town of El Arish, was swept away. The writer visited Ruafa in August 1924, and found that a pond, which had been excavated in the east side of the wadi bed to serve as a reservoir in connection with the dam referred to above, had been filled to a considerable depth with the mud brought down by the seil. This mud had hardened and shrunk into blocks of an average width of about 60 centimetres. The cracks between the blocks were from 5 to 10 centimetres, and extended to a depth of about 50 centimetres, the mud being still plastic at that point. It is noteworthy that the blocks were all of an irregular form, and that none approaching the hexagonal shape were seen.

The fine yellow clay composing these blocks was highly calcareous, and was close textured (though porous) and homogeneous to within about 1 centimetre of the top, at which point the texture became more open, and the clay riddled with small sinuous, flattened, tube-like channels, the length of which lay horizontally rather than vertically. On treatment with hydrochloric acid and washing in water, the clay yielded a small quantity of finely divided vegetable matter. The uppermost 2 millimetres of the clay, forming the actual surface, was covered with small raised irregularities, not more than 1 millimetre in height, and small holes (like pinholes), the whole presenting a frothy appearance.

As shown in the accompanying photograph, which was taken vertically from a height of about 12 feet, the surface of every block was covered with a perfectly regular series of larger circular depressions, averaging 4 centimetres in diameter and 1 centimetre depth. These

markings were distributed at regular intervals of about 5 centimetres from centre to centre. Mr. T. W. Kirkpatrick kindly obtained some further samples for the writer, and from one of these it was possible to determine that the apparent depressions are, in reality, collapsed bubbles. In one block, two bubbles remain with their upper surfaces still raised some distance above the general level of the block. The "frothy" material described above forms the upper skin of the bubble, the interior being quite smooth.

The cause of these markings, which cover an area of some 3000 square metres, is obscure. From inspection of the photograph, it will be evident that their formation was antecedent to the drying and shrinking of the blocks, since the shrinkage cracks are seen to cut across the depressions in many places.

As hail was known to have occurred in Northern Sinai in the spring of 1924, the first explanation that suggested itself was that the markings were the splashes made by the last hailstones of such a shower. This explanation is however hardly satisfactory, since the extraordinary regularity of the markings is scarcely consistent with such a theory. The possibility of the bubbles being produced by gas formed *in situ* can be dismissed, as there is certainly insufficient vegetable matter to provide the required amount of methane. A gas seepage, either permanent or temporary, from the chalk below however is possible.

Two other simple possibilities presented themselves:

(*a*) *Mechanical Formation of Bubbles in the Mud itself.*—An attempt was made to test this supposition by puddling a quantity of the material in a large receptacle, and agitating it vigorously with a mechanical stirrer at various stages in the drying of the mixture. A few small bubbles were produced by this means; but they were all of small size and irregularly distributed.

(*b*) *Trapping of Air in already Dried Mud by Water rising from below, the Surface having already been puddled by Rain.*—The clay is certainly very porous; but experimental testing of this hypothetical explanation would involve the construction of special apparatus, and the expenditure of a considerable amount of time. The time factor being prohibitive, no experiment could be made.

None of the explanations which have suggested themselves seem consistent with the size and regularity of the bubbles as seen in the field. It is possible that some reader of the *Journal* has observed similar markings in circumstances which permitted the true cause to be ascertained.

Hoping to find some explanation of these interesting facts before publishing Mr. Bowman's note, we submitted the material to Mr. W. Campbell Smith, of the Natural History Museum, who replies thus:

"I have shown Mr. T. Sutton Bowman's letter and photograph to about half a dozen geologists of various kinds. The only one who has made any

helpful suggestion is Dr. Bather. He at once showed me a slab of sandstone in Gallery XI. in the Geological Department which shows approximately circular depressions similar in size to and as regularly distributed as those in the photograph.

"The sandstone is from the Trias at South Hadley, Mass., U.S.A.; the markings, originally attributed by Hitchcock to the tadpoles of a large batrachian, *Batrachoides nidificans*, are now supposed to be due to ripple-marks caused by two interfering sets of ripples. Vaughan Cornish, in 'Waves of Sand and Snow,' 1914, fig. 56, gives a photograph of sand rippled by two sets of waves, but the pits caused have rectilinear boundaries and are four-sided. Whether such a formation as Mr. Bowman describes could be due to interfering sets of waves in a large pond I do not know, but the suggestion may be worth consideration. None of us feel ready to accept the collapsed bubble explanation."

On the other hand, it seems unlikely that many people will accept these circular markings as due to interference of waves: their circularity is all against it. The material was next submitted to Mr. Beadnell, who writes:

"I am well acquainted with these silt deposits of the Wadi Arish. In many localities small areas of the silt are annually cultivated by the Arabs—the rains not being, I think, so infrequent as Bowman suggests. The silt is always of an extraordinarily fine texture, especially the uppermost layer, and notably so in those depressions along the wadi floor where the water has remained for some time and gradually evaporated. Often I have noticed strikingly perfect impressions of rain-drops on its surface, *i.e.* imprints of a shower which has fallen on an exposed surface of still damp clay. But in Bowman's photographs the circular areas appear to be elevations and not depressions, and are, I imagine, just dried mud bubbles.

"Doubtless a certain amount of air is imprisoned in the silt when the latter is laid down, and as the deposit settles and consolidates this air tends to be expelled. Ordinarily the air, or part of it, contained in a deposit in process of settlement would escape through the pores without leaving any trace, but in these particular silts the uppermost layer is generally of the very finest clay imaginable, and probably almost entirely lacking in porosity. Air escaping from the lower laminæ would tend to push this fine non-porous uppermost layer into excrescences or bubbles. Some of the latter would hold and others burst open and collapse, as appears from the photographs.

"Bowman describes the deposit as being more porous above than below. This might be so, as these deposits are the result of periodical floods of varying intensity, with consequent variations in the material. But my point is that the final and uppermost layer of any particular flood deposit is the most close-textured of all, being formed of the finest clay particles, *i.e.* those held in suspension and only completely deposited on evaporation of the pools which often remain many hours on the floor of a wadi after the flood (seil) has passed."

This, then, confirms the theory that they are bubbles, but does not explain their remarkable regularity. We shall be glad to receive information of similar markings that have been examined elsewhere.

## OLYMPIA

**Olympia: its History and Remains.**— **E. Norman Gardiner, D.Litt.** Oxford: Clarendon Press. 1925. $10\frac{1}{2} \times 7\frac{1}{2}$, pp. xx.+316. *Plans and Illustrations.* 50*s. net.*

THOUGH Olympia has been excavated for more than forty years, this is the first book in English about the site and its remains. Dr. Gardiner has already written a valuable essay on 'Greek Athletic Sports and Festivals' (London, 1910); but Olympia was more than a sports-ground; it was a great national sanctuary, a palatial museum of art, rich in masterpieces of every period of ancient craftsmanship; and above all a meeting-place of Greeks from all parts of the Hellenic world, and especially (in early times at all events) a homing-ground for the colonial Greeks of the Italian and Sicilian West. Before and beyond all this, Olympia had a long earlier existence, and presents problems as to the origin of its peculiar festival, and its exceptional prestige, which require geographical as well as historical and archæological treatment. That is the justification for discussing such a volume here.

North-western Peloponnese differs geographically from the rest of the Morea, and has always offered opportunities for settlement far ampler than those of the Arcadian interior, or the continuations of the coast-land into the Achæan riviera and the highland of Western Messenia. A coast-plain widening to ten miles, and traversed by two perennial rivers, is a rarity in Greek lands, and an object of admiration and jealousy. It would have been more harried by acquisitive neighbours than it was, if it had not faced away from the principal Greek centres around the Ægean basin, and been protected from oversea aggression by a great stretch of open water. Only from the wild Ætolian north, across the gulf of Patras, was there risk of disturbance, repeatedly realized. Within this natural region, Olympia occupies the chief junction of communications. It was never a capital, nor a great centre of trade or industry, otherwise it might have become a Peloponnesian Rome; but as a sanctuary and rendezvous, it enjoyed security and wealth far greater even than its position guaranteed; and as Dr. Gardiner ingeniously suggests (p. 25), invaders from the only dangerous quarter did but scatter its earlier votaries over a large southerly hinterland, and spread its influence and prestige, as is shown by the list of early victors in the festival games.

Though the Hellenic sanctuary was thoroughly explored, more than a generation ago, by the first really scientific excavation on a considerable scale—a landmark in archæological method—it was only in 1907 that its prehistoric antecedents were revealed, in the course of an inquiry primarily intended to test Dr. Dörpfeld's ingenious notions about the topography of Homer's *Odyssey*, and his interpretation of some very puzzling remains which had rewarded his examination of traditionally Homeric ground in the neighbourhood of Ithaca. The result was to show that the spread of the bronze-age culture of the Ægean round the coast of the Morea had been complicated by the strong contrast between the previous barbarisms of this north-western region and of the principal regions of Minoan colonial expansion, around the eastward-facing gulfs of the Greek mainland. The Cretan culture, and even its Mycenæan colonial offshoot, stopped rather abruptly short on the margins of this region; and what stopped it was a local culture, not so advanced materially, but distinctive and vigorous enough to hold its own, and to hand on some of its peculiarities into historic times. Probably in this early phase, as certainly later, Olympia and its neighbours shared many customs and beliefs with the people

of the wild northern districts beyond the gulf, in the direction of the other great early sanctuary of Dodona far away beyond the Gulf of Arta ; and, as so often elsewhere, archæological data have supplied the starting-point for a fresh analysis of the complex evidence from tribal legends and local rituals preserved in literary authorities in later ages.

Consequently the early chapters of Dr. Gardiner's book have an interest and importance far beyond the popular estimate of what the " Olympic Games " signify. They are a contribution to the history of the Greek people, and to the geography of Greek lands, which deserves careful study, and is admirably set out for the specialist as well as the general reader.

Then comes the Olympic Festival, and its Games, not necessarily an original item in its ritual, but eventually responsible for its exceptional vogue in Hellenic times. Here too, even after the copious commentary of the German excavators, there has been much for Dr. Gardiner to discuss, in the light of subsequent finds at Sparta and elsewhere, and of more scientific handling of the literary material. Questions of geographical distribution, in regard to religious beliefs, schools of craftsmanship, and customary lines of intercourse, arise on almost every page ; and are complicated as the story goes on by the redistributions of political influence and ambitions which are the commonplaces of ancient history, but gain a fresh vividness and meaning when they are considered in their effects on this secluded yet by this time nationally important locality and institution.

Dr. Gardiner's book, therefore, deserves the attention of geographers as a scholarly and broad-minded examination of a region and its régime, for the long history of which the materials are fairly copious, very varied, and capable of re-interpretation in a very striking and suggestive way.

With his archæological chapters, about buildings and works of art, and about the conduct of the festival and games, there is the less need to deal here, because the need for such a handbook has long been obvious, and Dr. Gardiner's previous contributions to our knowledge of Greek athletic festivals indicated him in advance as the right man to attempt it. He has thoroughly digested the literature, has a trained eye for style and meaning, and a happy way of presenting a great mass of detailed information without losing the main thread of his story. The illustrations are well chosen, and sufficiently numerous to give a very full impression of what Olympia had to offer to its votaries in the days of its splendour ; and the volume is produced in a style which is in accord with the high traditions of the Clarendon Press. J. L. M.

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## REVIEWS

### EUROPE

**Rambles in Old London.**— **George Byron Gordon.** London : The Bodley Head. 1924. 9 × 6, pp. 334. *Illustrations.* 15*s. net.*

In writing this book the Director of the University Museum, Philadelphia, states that he had no other aim than simply to gratify a personal desire. This will not make it the less interesting to his readers, and is in fact a tribute to the fascination of London. Indeed, the most serious criticism that could be directed against the book is that the author experiences this fascination so strongly that he is led to press London's claim to extreme antiquity and continuity with more enthusiasm than authority. He insists that the real foundations

of London were laid in Neolithic times; that "the beginnings of the City were more remote from its later Roman days than these are from the present;" that the London Stone, not definitely mentioned until the fifteenth century, is really similar in kind to Stonehenge; that the surmise of the abandonment of the site between Roman and Saxon times was entirely erroneous; and sees no possible rivals in importance in Verulamium or Camolodunum. These points however do not affect the main interests of the book, which displays a knowledge of and delight in London which must be greater than those of very many of its citizens. Every building of importance, past or present, seems to have its place here, accompanied by allusions widely drawn from literature. Very excusably, Mr. Gordon displays some uncertainty as to the extent and government of the Metropolis, and refers to one authority as the "London Board of Health." Further slight confusion on more special points is indicated in his references to "benefit of clergy" and to the action of tides. He candidly remarks upon the difference between American and English crime statistics, though we would hesitate to attribute it, as he rather oddly does, to the long-continued elimination of the criminal classes by Tyburn tree, as we would also hesitate to assign it to the transportation of numbers of them overseas.

**The Old Straight Track.— Alfred Watkins.** London: Methuen & Co. 1925. 9 × 5½, pp. xviii. + 234. *Maps and Illustrations.* 18*s. net.*

The subject of this book is not, as might be supposed, Roman roads, but early British trackways, that is, prehistoric cross-country paths for man and horse, "often with no more structure than that made by the users' feet, but perhaps stoned and 'pitched' in places." What its author seeks to prove is that mounds, moats, beacons, and markstones fall into straight tracks, *i.e.* sighted lines, throughout Britain, with fragmentary evidence of trackways on the alignments. The suggestion is that such alignments are humanly designed facts and not accidental coincidences. The basis of the argument is early artificial mounds. Whether the point is proved or not—and we are inclined to think it incapable of proof—there is much attractiveness in these pages for the open-air man who likes to combine a study of the 1-inch map with the use of feet and eyes in long country rambles. In fact, Mr. Watkins has invented a fascinating open-air game and given us instructions how to play it; and there is already quite a goodly company of ley hunters. His own countryside of Hereford and Monmouth is excellent for the purpose, but the Sussex and Kent Wealds also serve admirably, their double lines of sand and chalk ridges of the north corresponding to similar ridges in the south. The ridges themselves were undoubtedly the chief directions of travel, but here, if anywhere, the cross leys should be demonstrable. We would suggest to believers the use of Lambarde's map of Kentish beacons. But we are not convinced believers, though interested readers. Mounds (sometimes relatively thick on the ground), place-names, folk-lore legends are airy, unsubstantial evidence compared with the spade work which can establish a Roman road in three or four places at reasonable intervals. It seems to us that Mr. Watkins fails by proving too much: his old straight tracks are too thick on the ground. The Radnor mound alignment, for example, gives two tracks which cross at a camp: in their whole length of 18 miles they are never more than 1½ miles apart. Were these early track-makers so lavish of their pains that they could not make one east-to-west track serve their purpose? The author is a bold, painstaking, and ingenious trafficker in coincidences, as also in etymologies of a very doubtful kind; incidentally he is a bad offender in the ungrammatical

use of the English present participle. For all this, the book administers a needed tonic to a generation of travellers by train and motor car: it gets back a long way into primitive conditions. S. E. W.

**Prehistoric and Roman Wales.— R. E. M. Wheeler.** Oxford: Clarendon Press. 1925. 9 × 5½, pp. 400. *Sketch-maps, Plans, and Illustrations.* 18*s. net.*

The archæological material available for writing the prehistory of Wales is much less than is often supposed, and Dr. Wheeler, in his attempt to give a connected account from Palæolithic times to the Roman occupation, subjects the evidence to a critical examination characterized by caution and reserve. Of Palæolithic man there is little evidence. Much has been made of the finds at the Paviland cave, but in view of the skeleton having been found only 6 inches deep and without the skull, and the slight Aurignacian character of the accompanying artefacts, this calls for caution, and the avoidance of broad inferences and generalizations. Of the Neolithic Age the most striking evidence is the stone axe factory at Graig Lwyd, where, curiously enough, there is little corresponding evidence of settlement. In fact, the absence of any sign of domestic occupation generally has suggested that the Neolithic population was probably nomadic. In an interesting chapter the Megaliths are described, illustrated, and compared with those elsewhere. Their origin, distribution, and builders are discussed, and the weakness of the theories of Eliot Smith and Perry pointed out.

Nineteen beakers, mostly discovered in connection with burials, attest the presence of the Beaker Folk chiefly in the north-west and south-east. On reaching the Later Bronze Age we are on firmer ground. No fewer than thirty Bronze hoards have been found, and a great variety of bronze objects and pottery have come to light, showing that the Bronze Age population was distributed over a great part of the principality. The objects of gold discovered of Bronze Age are of more interest from their character than number, for it shows their connection with Ireland, whence they were no doubt derived. But here again no dwelling site of Bronze Age date has ever been found. Strangest fact of all is the paucity of remains of the Early Iron Age, "the darkest period in the prehistory of Wales." Not a single sherd of pottery that can with certainty be ascribed to that age has been found. Late Keltic Art is represented only by a carved quern stone, an iron fire dog, and a few objects of bronze and gold which show the characteristic curvilinear decoration of this period.

The character and extent of the Roman occupation depend a good deal on the imagination which can picture the state of affairs from a study of the fort of Caerleon, and a few small forts in different parts of the Principality, remains of a few scattered dwellings, and the only fully developed Romano-British town in Wales—Caerwint. Here, and on the subject of Roman mining, the author proceeds with the same care and caution, and we can only hope that further research will throw more light on this early period of British history. The book is well illustrated, and four maps are added showing the distribution of Megaliths, the remains of the Early and Late Bronze Age, and of the Roman period. E. A. P.

**Excavations in Malta.— M. A. Murray.** London: B. Quaritch. Part I., 1923. Part II., 1925. 11 × 7½, Part I., pp. 50; Part II., pp. 44. *Plans and Illustrations.* 7*s.* 6*d. each.*

These two volumes contain an account of excavations made by the author during two seasons in 1921 and 1922. They refer chiefly to work at *Borg en*

*Nadur*, a site above St. George's Bay, in the south-east of the island. Here are a great many megaliths so scattered and broken that it is difficult to draw any certain conclusions as to their significance and meaning. There are however two features of interest, a trilithon, known as the Dolmen, and the groundwork of an apsidal building composed of four apses, two on the east, and two to the west, recalling similar structures discovered elsewhere in the island. There is a difference of opinion regarding the use of these apsidal buildings, some regarding them as dwellings, others as temples. Miss Murray adopts the latter view, and further suggests that there may have been a temple dedicated to an Early Semitic deity. The site yielded enormous numbers of potsherds, but hardly a single complete pot. Although only three pieces of bronze were discovered, most of this pottery is attributed to the Bronze Age. A ware different in several respects, and in lesser quantity, is believed to be neolithic. The author in this follows Professor Zammit's classification, which appears to rest on rather slender grounds. The opportunity is taken of giving an interesting and well-illustrated description of the Bronze Age pottery of Malta generally, of which a full account is promised later. This is not only valuable in itself, but may throw light on the early population of the island. From this study Miss Murray concludes that the only theory that fits the facts is that the Bronze Age people arrived in Malta with their civilization already completely developed, and that their occupation of the island lasted only a short time, too short for the pottery to undergo any change. Another interesting question is whether the Neolithic inhabitants died out before the metal-using people arrived. The fact that there is no transition period apparent between the Neolithic and Bronze Ages, and Professor Zammit's discoveries at Tarxien point in this direction.

The Reports are prefaced by an account of Miss Cater Thompson's excavations of the floor of the Ghar Dalam cave close by, where in 1917 were discovered two Neanderthaloid molar teeth which have much interested anthropologists. Unfortunately, except for an incisor tooth, no other human remains and no trace of Mousterian culture were found. No further support was therefore obtained for the presence of Neanderthal man in Malta.

The generous aid of the Percy Sladen Trust has enabled the author to illustrate the Reports with a series of excellent plates, showing the site, megaliths, pottery, and other objects found. Though much less significant than the famous Maltese magalithic monuments at Mnaidra and Hagiar Kim, these researches show that the same civilization extended to this part of the island, and add to the archæological interest of Malta. E. A. P.

**Constantinople.— George Young.** London: Methuen & Co. 1926. 9 × 5½, pp. 304. *Twelve Illustrations and a Map.* 12*s.* 6*d. net.*

Of making many books on the subject of Constantinople there is no end, and the theme is so well worn that any attempt to rewrite the history of the "City of the Cæsars" might be considered an ambitious task indeed. Mr. George Young has however succeeded admirably in the face of many obvious difficulties. The magician's wand which he wields with such insight and humour has clothed the dry bones of Byzantine and Ottoman history with an unsuspected web of romance and "human interest." Whether he is describing the Saxon Body-guard of the Comneni, the immoralities of the Empress Theodora, or the home-life of Abdul Hamid, Mr. Young makes the crowded history of the city live before us in all the glowing colours of reality. The author has delved deeply for his information among the

mediæval histories of Constantinople. His versions of the two conquests of the city—the Latin conquest of 1204 and the Turkish of two and a half centuries later—are particularly graphic and illuminating; he shows clearly that the ineptitude and worthlessness of the Byzantine rulers had made the fall of the Empire inevitable, long before the Ottoman Turks came on the scene. The horrors perpetrated after the sack of Constantinople by the Latin swashbucklers of the Fourth Crusade certainly out-heroded any of the later atrocities of Turkish times, but the author judicially tempers our sympathy for the Greeks by showing how their treachery and deceit had been largely instrumental in bringing the Second Crusade to a disastrous end.

When he carries the story of Constantinople down to modern times, Mr. Young is no less interesting and instructive. His own diplomatic experiences at the British Embassy, and his laborious researches into Ottoman Civil Law, have given him an exceptionally clear and true insight into the political and economic changes of the past twenty-five years. This weight of knowledge, however, intrudes no note of pedantry or tedium. The historical mosaic is fitted into a guidebook-like framework of descriptive matter, enlivened with the author's personal reminiscences, and fortified with well-chosen extracts from modern writers. Unlike many recent books on Turkey, for instance that by the late Lord Eversley, Mr. Young's scholarly work is remarkably free from errors. One "howler" has crept in on page 127, where he speaks of the "year of the Hedjaz," instead of the Hijra, and on page 203 he is inaccurate in talking of *two* islands—Leander's Tower and the Maiden's Tower—between Seraglio Point and Scutari; there is, of course, only one island, the Maiden's Tower, wrongly identified with Leander. One could have wished, too, that the author had not chosen the French orthography of Turkish names, such as Djami, Tchanak, and Tchataldja, with its redundance of consonants. These trifles, however, do not detract from the general excellence of the work. No better "guide-book" to Constantinople has ever been written, while, for the more serious student of either mediæval or modern history, the pageant of the city's Byzantine and Ottoman rulers has never been more truthfully or more refreshingly depicted.

J. H. M. C.

ASIA

**The Chronicles of the East India Company Trading to China, 1635-1834.—H. B. Morse, LL.D.** Oxford: The Clarendon Press. 1926. 4 vols., 9 × 5½. In all, pp. xlvi. + 1589. 19 *Illustrations and* 5 *Maps*. 70*s. net.*

It is perhaps strange that the mass of records at the India Office, filling nearly three hundred volumes, which tell the story of English trade with China in the days of the East India Company's monopoly, should have escaped the notice of the many students who nowadays are searching in all directions for materials for degree theses. But, if strange, it is certainly fortunate, for otherwise we should not have had this study of them by the man who was of all others most competent to deal with the subject. Dr. Morse's long experience of China, and his expert knowledge of the commerce and its history, have given him special qualifications for such a task, and every one who is interested therein will be grateful to him for undertaking it.

As the result, in the four handsome volumes now published we have an exhaustive history of the trade, from its humble beginnings in the seventeenth century down to the time when it was thrown open to English merchants in general. There are some regrettable gaps in the story, due to the loss of the

records; but for the rest the author goes through the documents season by season, giving the ships sent out, the cargoes they carried, the steps taken to dispose of the goods and to procure return cargoes. In the early days tea was a minor feature of the exports, gold, raw silk, silk goods, copper and china-ware being the principal items of the investment; but the position was reversed early in the eighteenth century. The provision of funds to purchase these goods was generally a difficulty, since English manufactures (which the Company was bound by law to carry out) were in little demand; and the author's explanation of the various ways in which the trade was financed is one of the most valuable features of the work.

Many other matters of interest occurring in the records are touched upon, including the various embassies to China. In addition to the very full information provided about English trade, we learn much about that of foreign Europeans. American commerce at Canton is of course a leading topic; and so is the "country trade" from India. The opium traffic figures largely, though the East India Company always discountenanced the importation of that drug, in view of the fact that it was a forbidden commodity.

An interesting example of how records may be illuminated by special knowledge occurs in the case of Captain Weddell's famous voyage in 1637 to Macao and Canton. The story is excellently told, from the English point of view, in the third volume of 'The Travels of Peter Mundy,' published by the Hakluyt Society in 1919; but Dr. Morse, in summarizing it, is able to look at the details through Chinese eyes, and thus to explain the attitude adopted by the local officials. Weddell's white flag was disregarded because such a symbol had no significance to a Chinaman; while the alternate attempts to bully or placate the new-comers are shown to have been probably due to dissensions between the civil and military authorities. Similarly, many of the difficulties encountered later by the foreign traders had their origin in disputes between the various officials at Canton, or else in the relations between those officials and the central government. Affrays between English sailors and the populace constituted a frequent source of trouble; and in cases where a Chinaman was killed, the outlook was often serious, since the authorities were usually peremptory in demanding a life for a life, no matter whether the person executed were the real culprit or not. However, the Company's representatives, to whose abilities the author pays a high tribute, were for the most part fully equal to the demands that such incidents made upon their diplomatic skill. It is pleasant to note that the Chinese merchants with whom they dealt were mainly men of the highest character and honourable in all their transactions, even to their own undoing. One example of this occurs in the case of consignments of tea rejected by the Company on receipt, as being of inferior quality. For many years these were sent back to Canton and their value claimed from the merchants concerned; but later they were destroyed in England, and merely a statement of the quantity, etc., was forwarded. Yet this statement was accepted without demur by the merchants, though the amount involved was usually considerable. The same praise cannot be given to the Chinese officials, both local and imperial. Their exactions from the unhappy merchants through whom the foreigners dealt were continuous and heavy; while their arrogant attitude towards the Europeans was a constant source of annoyance and actual danger.

A useful feature of the work is the number of important documents reproduced at full length in the appendices to the various chapters. There is a good index, and the illustrations are well chosen and of great interest.

W. F

**Burma as I saw it, 1889–1917, with a Chapter on Recent Events.— R. Grant Brown, I.C.S., Retired.** London: Methuen & Co. 1926. 9 × 5½, pp. xv. + 234. 15*s. net.*

Burma has ever cast its spell over those whose lot it has been to live among its people: the more intimate the relations, the stronger the fascination. In the work before us the author does not parade his affection for the land and people; he does not overpaint his pictures, as some have been inclined to do. Nor does he specialize on any particular theme; he presents a general survey of the province from a wider point of view, based upon personal memories during twenty-seven years' work among, and for, the people. He gives a brief sketch of the history leading to the inclusion under one government of the area now known as Burma; of its salient geographical features; of the several races that have coalesced to form its people, their domestic, communal, religious, and social life; while certain chapters are chiefly devoted to a more searching review of matters of administrative importance, such as education, taxation, and the general scheme of government.

In his *coup d'œil* Mr. Brown takes us from the far north-western corner to the southern extremity of the province, from the rugged mountains around the upper reaches of the Chindwin river, with their fighting Kachins and wild head-hunting Naga tribes on the Assam frontier, through the narrow seaboard region of Arakan and the fertile alluvial tracts of Lower Burma away to the sea-girt islets of the Mergui archipelago. The chapter on the Far South is perhaps the most picturesque, with its pleasing descriptions of natural scenery—the Marble Isles, with their cliffs and caves and limpid seas, the edible birds' nests made by the interesting *Collocalia* genus of swifts, and the curious, almost amphibian, race of Salons.

With a variety of evidence pointing to connexion between India and Burma in prehistoric and early times, the question of the route by which this intercourse took place has puzzled many. There was the sea route round by the dreaded "Dragon's coils," or "whirlpool"; otherwise the countries were seemingly isolated by a great series of ranges of high inhospitable mountains. But mountains do not appear to have been so deterrent in earlier ages as they are now. About 500 years ago, in pursuance merely of commercial travel, it may be noted, Nicolo dei Conti crossed the ranges between Arakan and the Irawadi plains in seventeen days, and then went on to Ava.

The author's views upon administrative problems, though not all perhaps practicable under present conditions, are the result of ripe experience and mature thought. In chapter xii. in a few closely reasoned paragraphs he demonstrates the inevitable consequences of imposing upon a country a system of government not based upon principles consonant with the traditions and temperament of the people, but framed upon an alien model. He puts the matter in a nutshell elsewhere (p. 71) in the following words: "where strange institutions of foreign origin have been introduced public opinion fails to act, or is absent altogether."

The book is illustrated by many excellent photographs. A better map and fuller index would be improvements. C. E. A. W. O.

**Races of Burma.— Major C. M. Enriquez.** Calcutta: Government of India Central Publication Department. 1924. 9½ × 6½, pp. xiv. + 80. *Maps and Illustrations. Rs.*5.14 or 8*s.* 6*d.*

As it is a handbook for the Indian Army avowedly written to assist recruiting, the value of this work to the ethnologist and geographer may be overlooked.

The amount and variety of the information it contains regarding the numerous races of Burma, their characteristics, culture, origin, and migrations, illustrated with more than a dozen good photographs of types and two maps, are such as to be of great interest to every serious student of ethnology and geography. The number and diversity of the races of Burma are truly extraordinary, and the study of their distribution, relationship, and migrations a difficult though fascinating one. Major Enriquez, out of his large personal knowledge, is able to describe many of them in brief, clear, and direct terms which enable one to visualize the people better than more elaborate general descriptions often do.

The distribution of the many different races can only be understood by reference to the migrations which have taken place in a southerly direction from over the northern boundary. The probable routes of these migrations the author describes and discusses at some length, with the aid of a coloured chart. Three in number, these migrations are, from west to east, the Tibeto-Burman, the Tai-Chinese, and the Mon-Khmer. The first, a threefold invasion, accounts for the *Chins* and *Kachins* on the west, the *Burmese* tribes in the middle, and the *Lisu* on the east. The Chins of the mountainous west are remarkable for their bewildering variety of language and dialects, the language of a village being in some cases not intelligible to people living a few miles away. They were followed by the Kachins, who reached Burma only two or three centuries ago. In a few paragraphs a graphic account is given of their animistic religion, or *nat* worship, the nats presenting themselves through mediums, or *Myihtoi*, who are held in high regard. The Lisu, of Lolo race, are brave and independent people, whose hereditary chiefs inherit from father to youngest son. The Tai-Chinese migration is responsible for the Shans and Karens. The *Shans*, the most widely distributed race in Indo-China, entering Burma in the middle east, a wave spread right across Northern Burma and over the Indian frontier into Assam; another went south-east into Siam, where they form the great majority of the Siamese. In Burma the Shans number over a million. The *Karens*, a sturdy race, probably of Chinese origin, passionately loyal to the British, entered Burma on the east and have spread down the south-east side into Tenasserim. Next to the Burmese they form the most numerous race in Burma, numbering more than 1,200,000. The Mon-Khmer migration, generally held to be the earliest, moving down the Mekong valley, spread laterally into Burma, and is represented by the *Palaungs* and *Was* in the north-east, and the *Talaings* in the extreme south, in the region of Pegu and the deltas. The *Wild Wa*, living in an unadministered district, are head-hunters, heads being taken annually for sacrifice to the nats at ploughing-time. The Talaings, a very ancient race, after a remarkable history are gradually disappearing, being absorbed by the Burmese.

It is sometimes said that the world is now so fully explored that few virgin fields are left for the discoverer. This certainly does not apply to its ethnology. This book shows how much there is still to be learnt concerning the races within the confines of a single dependency of the Empire, no one of which, says Major Enriquez, is known to the outside world by its correct name. "Here is a vast country," he says, "the races of which are varied, and in places their distribution is confused. We are frankly on the edge of the unknown. Our ethnological research is limited, and far from scientific. The linguistic survey of India was abandoned in Burma as a thing beyond our present capacity. We have only just got a good history. We are at the beginning of archæology, and epigraphically are only scratching on the surface. The literature at our

disposal is slight, scattered, and often incorrect. But here in all these difficulties is the incentive for research. In every direction there is a virgin land to explore."

E. A. P.

AMERICA

**The United States as a Neighbour from a Canadian Point of View.— Sir Robert Falconer, K.C.M.G.** Cambridge: University Press. 1925. 7½ × 5, pp. viii. + 260. *Sketch-map.* *7s. 6d. net.*

The President of Toronto University treats authoritatively and arrestingly of the rise and progress of two nations and cultures on the North American continent, the drawing of the physical boundary between them, their common characteristics and their differences, their political, economic and social relations. After surveying this wide field, he concludes that Canada is specially fitted to be the intermediary to bring the British and American peoples together—" a part given to few nations in the progress of humanity."

**An Account of the Conquest of Guatemala in 1594 : Pedro de Alvarado.—** Edited by **Sedley J. Mackie**, with a facsimile of the Spanish original, 1525. New York: The Cortes Society. 1924. 8 × 6, pp. 146.

The Cortes Society, existing for the purpose of publishing documents and narratives connected with the discovery and conquest of Latin America, and thus supplementing, along a specialised line, the fine work of the Hakluyt Society of London, has done nothing more useful than the publication of this volume, dealing with the entry into Guatemala and Salvador of the Spanish conqueror, Don Pedro de Alvarado. The whole story is hazy, resting chiefly upon the bald relation contained in two letters sent by Alvarado to his superior officer, Hernan Cortes; and although the editor introduces side lights contributed by the brief mention of Bernal Diaz, and the indictment of the methods of Alvarado made by Father Bartolomé de las Casas, they render less illumination than the account written from the point of view of the native tribes, and called (by the original translator, Brinton) the "Annals of the Cakchiquels," republished in the present volume.

The reduced facsimile of Alvarado's letters is of great interest, and excellently done. Unfortunately, the same cannot be said of the "sketch-map" of a part of the region under consideration. Many important places are omitted, others are misplaced or misspelled, and the internal evidence of the Foreword shows that the editor's topographical acquaintance with Central America was slight; the notes on the aborigines are loose, to say the least. Nevertheless, the publication of the collected material bearing upon the conquest of Guatemala is a good piece of work.

L. E. E.

**Last Memories of a Tenderfoot.— R. B. Townshend.** London: John Lane. 1926. 9 × 5½, pp. 270. *12s. 6d.*

An interesting book, containing more of the author's recollections of Colorado in 1870, and a number of letters written from that country and New Mexico in 1903. At this stage the late R. B. Townshend was anything but a "tenderfoot." He had not only wide and varied experience, but the seeing eye and understanding mind, and a refreshing sense of humour. There are tales of perilous journeys, Indian feuds; of mountains, tablelands, and forests; and though much of the book is presented in an informal and familiar style, it is valuable as a record of unusual things seen and heard in regions then little known. The "Letters from Jemez Hot Springs," and on

the Mesas of New Mexico, contain graphic descriptions, but perhaps the best parts of the book are those dealing with native Indians and their customs; the Pueblo Indians of New Mexico, for instance, mostly a kindly people, hospitable, honest, and simple, building terraced houses of stone or adobe, on which, not many years ago, the Watcher of the Dawn might be seen every morning, looking for the return of Montezuma; their curious religion, half Roman Catholicism, half a peculiar spiritual world of their own, peopled by gods and dead ancestors and strange animals; their secret ceremonies on which no profane eye could look on peril of death. There have of course been many changes since these letters were written; the United States Government has established day and boarding schools for Indian children, and endeavours to make them into American citizens, while the Hopi dances are a recognized show for tourists. Nevertheless, the book is worth reading as a record of conditions at the time, and Mrs. Townshend has performed a service in collecting the letters in a permanent form. L. E. E.

**Argentinien-Chile von Heute.— Fritz Klute.** Lubeck: Otto Quitzow. 1925. 9½ × 6½, pp. 280. *Illustrations and Sketch-maps. RM.*12.

This book is at once a record of an extended visit to the Argentine and Chile, and a consideration in some detail of the economic position of both countries, and it suffers to some extent from this dual character. A considerable portion of the travel impressions are of no great interest, and lengthen the text unnecessarily. The author begins with his departure from Hamburg, but the interesting portion of his narrative, apart from some observations on Buenos Aires, commences with his description of life on the Patagonian pampas around Bariloche, the fringe of present-day settlement. His purpose was to investigate the extent and character of former glaciation in the Andes, and while geologizing along the foothills on the lee side of the divide, he had many opportunities for getting to know both the country and the people. These arid sandy tracts are devoted to sheep and cattle raising; the population is exceedingly scanty, and communications are mainly maintained by horses, and to some extent by motors, except when the wet season makes the going particularly heavy. Everywhere, on the large estancias owned by men of many nationalities and in humbler dwellings, he met with much hospitality, so that he writes of the life with enthusiasm. A chapter also deals with the Nahuel Huapi national park.

Discussing the Argentine in general, he considers her main problems to be the conflict between the pastoralists and the agriculturalists, the concentration of landed property in a comparatively few hands, and the consequent absence of a true agricultural peasantry, a want not made good by the immigration of illiterate Latin workers, who gravitate to the cities. On crossing the Andes he was first struck by the high standard of dairy farming and agriculture on the western slopes. These are largely owned by German settlers, who are retaining to a considerable extent their national identity, and the produce goes to the mining centres of the north. In the saltpetre and copper output of these mines, developed by foreign capital, lie the chief resource of Chile, and incidentally of the government's revenue. Both these are threatened by modern scientific developments, so that the future of the country appears to be uncertain. He describes visits to the copper-mines in the Atacama desert and to the Taltal saltpetre-mines, bringing out the contrast between the high organization of modern capitalist concerns and the primitive surroundings.

Throughout the book, special attention is paid to the position of German

immigrants, and it concludes with an appeal to better-equipped nations, and especially to Germany, to contribute to the solution of the diverse problems economic, scientific, and social, which confront the new nations of the south.

G. R. C.

## AUSTRALASIA AND PACIFIC ISLANDS

**In Unknown New Guinea.— W. J. V. Saville.** London: Seeley, Service & Co., Ltd. 1926. 8½ × 5½, pp. 316. *Plates, Text-figures, and Maps.* 21*s. net.*

**Way Back in Papua.— J. H. Holmes.** London: George Allen & Unwin, Ltd. 1926. 8½ × 5½, pp. 320. *Plates.* 10*s.* 6*d. net.*

There are books whose titles are deceptive, and but for the profession of the authors, one might be disposed to add these two to the number. 'In Unknown New Guinea' is not the book of a traveller, gathering impressions by the way, but that of a student and investigator. For many years, some twenty-five in all, Mr. Saville has lived on or near the island of Mailu, and from this centre he has carried on his detailed researches into the manners and customs of a little-known section of the Western Papuo-Melanesians—the Mailu and Mailu-speaking peoples of the island and the neighbouring mainland. The region dealt with is that part of the southern coast of the south-east peninsula of New Guinea which lies between Mullens Harbour and Cape Rodney; Amazon Bay, outside of which Mailu Island is situated, is the most densely populated part of the Mailu territory, and though the author journeyed both along the coast and inland, he deals more in detail with this focal point, and especially with the island itself.

The Mailu are the most eastern of the Western Papuo-Melanesians, and on the east they are in contact with the Massim, or Eastern Papuo-Melanesians. It is interesting to note that whilst the Mailu differ much more from their eastern neighbours, the Southern Massim, than from their congeners to the west, yet they have been more influenced culturally by the former. The influence has been, however, material and artistic, and they have retained their differences in social institutions. There is here a good example of the fact that in the transmission of culture it is the material factors that are in the van.

The book contains an intimate and well-written account of the life of the Mailu peoples, their social institutions and their arts and crafts, their trade and warfare, their religion and magic. There is also a brief account of the Dimuga, a Papuan people of the hinterland of Amazon Bay. Mr. Saville has qualified himself to deal with his subject, not only with scientific method, but with an absence of prejudice that is a qualification in itself. No one who has an interest in the peoples of the most fascinating of all islands can afford to be without this book, whether their affection tends towards sociology or material culture. The illustrations are numerous and illustrative.

Whilst it is with some sense of satisfaction that the ethnologist will note that Mr. Saville's title scarcely does justice to his matter, there may be a certain ruefulness in his contemplation of 'Way Back in Papua.' Mr. Holmes has, it is true, earned the right to give us his views of New Guinea and its natives in any form that pleases him, but one is rather at a loss to determine how far he has succeeded in whatever aim he had in mind in the present instance. There is a double thread or two, and a moral here and there, but perhaps the most definite conclusion we come to is that black is not easily made white. If the psychology of the few native characters in the book is true to life, however —and one cannot help feeling that the author does more than pull the strings

of action—there is a confessed willingness on the part of the victims of the experiment. As to the characters who are already white, they are obviously the puppets not only of fate, but of the author. An exception to the general tepidity of the portraiture is an aboriginal of the die-hard school, who overflows with tales of the good old days, when heads were hunted. His narrative forms an independent thread, which the ethnological reader may follow with interest and profit.

It is difficult to review a book that defies classification, and that in so many respects provokes criticism, without a risk of unfairness to the author's intentions. He has at any rate emphasized the fact that the white man's responsibility towards the natives does not end with their conversion to Christianity and clothing. H. S. H.

**A Primitive Arcadia : Being the Impressions of an Artist in Papua.— Ellis Silas.** London: T. Fisher Unwin. 1926. 9 × 6. Pp. 230. 29 *Illustrations and a Map.* 15*s. net.*

Mr. Ellis Silas brings a fresh type of mind to bear on Papua's jungles and islands and natives; and writes of them with the vision of the artist. He went to Papua, he tells us, in quest of the beautiful, and found it in the Trobriand Islands, where he remained for some three years painting and sketching. His work brought him into close contact with the natives, who admitted him to their friendship; and he came to learn much of their strange customs, which he did well to note and to record, even though his purpose was not primarily anthropological. This account of his experiences and observations is both interesting and valuable: he writes of native character with sympathy and insight, his chapters on the dances, death customs, feasts, maritime activities, and the social life of the islanders show him to be a shrewd and acute observer, and he has been able to illustrate his narrative with a number of delightful and effective sketches.

The difficulties he himself encountered in his work make pleasant, and often amusing, reading. Until they became used to him, the natives regarded him as a worker of magic, and as he sat at his easel he would be surrounded by an enormous crowd; but he is careful to record that despite the intense interest his painting aroused, he did not once suffer the impertinencies he had experienced when painting in British countries. Later, when he had erected a studio, he did not lack models, for he tells us that the young women were so attracted by his dazzling palette that at first they willingly undertook to pose, so long as they might help themselves to paint, and indulge in an orgy of making up.

The book is well produced, and furnished with a glossary and an index. The map is less successful. Many of the place-names are difficult to read, and in 1926 it is a shock to find a line "defining respective spheres of influence of Great Britain and Germany." O. R.

**My Crowded Solitude.— Jack McLaren.** London: T. Fisher Unwin. 1926. 9 × 5¼, pp. 186. *Illustrations.* 12*s. 6d. net.*

In his previous book, 'My Odyssey,' Mr. Jack McLaren showed himself a born wanderer. But there came a time when he became weary of adventuring in many places, and desired greatly to adventure in one place for a change. The opportunity to satisfy this desire came with a proposal to open up a coconut plantation at Cape York, the apex of that tremendous and to some extent unknown peninsula which "thrusts up amid the islands of Torres Strait and towards New Guinea like a pointing finger."

It was a South Sea land with a peculiarity all its own—the coconut palm was unknown there. That, however, was no reason why the palm should not be made to grow, for soil and climate were favourable. Mr. McLaren accepted the proposal, and proved that not only would the palm grow but that it could be brought into bearing in five years.

This book is the record of Mr. McLaren's adventures in one place. After long search he discovered a suitable site for the estate on the western shores of the peninsula, and after a brief visit to Thursday Island he returned to begin opening the estate. It is doubtful whether any white man ever began planting operations in the face of so many difficulties. To begin with, he was entirely alone. He had not even a dog, much less a servant or any labour force. Nevertheless he set to, cleared a site, and began to build a house. At last, as he had hoped, natives appeared, and finally were induced, nomads though they were, to start felling jungle. Mr. McLaren's story of his life and work for the next eight years, during which he never left his estate, makes intensely interesting reading; in his dealings with the natives, of whose strange customs he tells us much, he showed both tact and sympathy, and he writes of their lives, as of his own, simply and unaffectedly, often with humour. He shows very clearly how his surroundings grew upon him, so that even when his natives once left him for three months to go for a "walk-about" he was content to remain utterly alone in his little clearing on that lonely coast. O. R.

## POLAR REGIONS

**The Adventure of Wrangel Island.— Vilhjalmur Stefansson.** London: Jonathan Cape. 1926. 9 × 6, pp. 416. *Map, Portraits, and Illustrations.* 18*s. net.*

It is the misfortune of Mr. Stefansson that he is the subject of newspaper controversy in the United States and Canada. His opponents were therefore quick to seize on the tragedy of Wrangel Island in 1923, and to make the most of what we now know was a death probably from scurvy and a sledging disaster on the ever-treacherous pack ice. At the time the tragedy was pointed to as a proof that the doctrine of living on the land in the Arctic had broken down; the party were accused of incompetence; and it was even suggested that the Eskimo woman, Ada Blackjack, had failed to do her best to save the life of the member who died of scurvy. A full account of the real situation was necessary, and Mr. Stefansson has therefore written the history of the enterprise based principally on the diary of the second in command, Lorne Knight. The book makes it amply clear that no blame attaches to any member of the expedition. The story has had to be told at some length, but it leaves us both fully convinced of the adequacy of the party and with an increased admiration for Mr. Stefansson himself. The work will be of value mainly as an historical document, but at the same time Mr. Stefansson's own reputation is strengthened and enhanced by the dignity and restraint with which it has been written. J. M. W.

## MATHEMATICAL AND PHYSICAL GEOGRAPHY

**Phototopography: A Practical Manual of Photographic Surveying Methods. —Arthur Lovat Higgins, M.Sc., A.R.C.S., A.M.Inst.C.E.** Cambridge: University Press. 1926. 7½ × 5, pp. xvi. + 130. *Diagrams and Illustrations.* 6*s.*

A good introduction to the modern method of photographic survey would make a very useful book: and we are disappointed to find on examining

Mr. Higgins' manual it in no way fulfils the requirements of such a book—that its theoretical exposition should be limited to what is really useful; that how the theory is used should be made perfectly clear; and that the best modern methods and instruments should be described impartially. The chapters on Fundamental Principles has much talk about perspective, with no clear application to the case in which these principles are most used, the Canadian prairie air-surveys. The chapter on the "Photogrammeter" describes two cameras belonging to last century, but no recent instrument. The chapter on Photographic Surveying is vague and mysterious, *e.g.* "(1) *Reconnaissance*. Here the entire object may be embodied in photographical reconnaissance, the explorer following a certain route without regard to lateral detail, and completing his observations with progress." The fourth chapter, Photogrammetry, is mainly from Deville, who would have been surprised at the example of his methods: a phototopographical survey of a portion of Hampstead Heath less than 200 yards square, with ten camera stations.

We come last to Stereophototopography, in which the stereoautograph is described geometrically without, so far as we can see, any realization of the fundamental property of the "distance piece." There is no mention of the later models in which the plates may be inclined to the base, though Plate VII. evidently refers to this case. But we are astonished to learn that the photographs need not "be necessarily sharp, for exposures in weak light and poor positions afford acceptable results in the stereo comparator." The author comes finally to the Stereoplanigraph, but breaks off with regret that the scope of his work will not allow discussion of the (*a*) Koppe-Porro principle; (*b*) Dove prism; (*c*) Zeiss parallelogram; and (*d*) Optical Cardan joint; without which we can hardly understand how "the projection system is such that pictures may be treated stereographically which otherwise afford no stereoscopic impression."

The book has the air of being inspired by the propaganda of a particular foreign firm, whose lenses and apparatus are mentioned continually to the exclusion of others. The bibliography gives only one reference dated later than 1913. A. R. H.

**A Text-Book of Geology.**— **Prof. James Park,** University of Otago, N.Z. 2nd edit. Revised and Enlarged. London: Griffin & Co., Ltd. 1925. 9 × 6, pp. xix. + 527. *Frontispiece*, 71 *Plates*, 266 *other Illustrations*. 30*s*. *net*.

In the extract from the preface of the first edition we read that this volume "is intended to cover the requirements in Geology as now defined for Engineering, Mining and Agricultural Schools and Colleges." The subject-matter is treated in the conventional way, and is clearly and interestingly presented.

The volume covers a wide range of subjects, and this is perhaps its main disadvantage, because it naturally follows that the treatment is often rather dogmatic. We agree with the criticisms given in the review of the earlier edition (*vide Geogr. Journ.*, **44**, 1914, 406). Although the chapter on Coral Islands has been re-written for this edition, we see no mention of Professor W. M. Davis's work; and part of the account of marine accumulations is open to criticism. Again, whilst recognizing the limitations of space, we feel that the account of the origin of mountains is over-brief—especially in view of the great amount of recent work on Alpine Structures.

Even if not strictly in our province, we would direct attention to one or two defects in the Stratigraphical part of the volume—particularly the rather

sketchy treatment of the Cambrian and Ordovician; the use of old generic names for some of the Carboniferous fossils; the position of the Upper Greensand, and the somewhat out-of-date references in some sections.

However, the volume as a whole covers the range of geological science adequately. It is admirably illustrated and well printed. The present edition is, in the main, a revision of the first edition; but some of the chapters have been entirely re-written. J. A. S.

## HUMAN AND HISTORICAL GEOGRAPHY

**The Cambridge Ancient History.** Vol. **2. The Egyptian and Hittite Empires to c. 1000 B.C.** Vol. **3. The Assyrian Empire.** Cambridge University Press. 1924, 1925. 9½ × 6½, pp. xxvi. + 752; xxvi. + 822. *Maps and Plans. Each* 35*s. net.*

A period of a millennium is covered by these two volumes, from the sixteenth to the sixth centuries B.C., during which empires rose and fell in the valley of the Nile, Western Asia, and Mesopotamia, culminating in one of the most catastrophic epochs in the history of the world. The outstanding feature of vol. **2** is furnished by the six chapters (iii. to viii.) on Egypt by Prof. J. H. Breasted. They are substantially taken from his well-known History of Egypt which has already charmed a multitude of readers. Prof. Breasted's account of the rise, decline, and fall of the Egyptian Empire is supplemented by a chapter on Religion, Law, Science, and Literature of the period by Prof. Peet. Dr. H. R. Hall takes up again the subject of Egyptian Art, and describes the contemporary architecture, sculpture, pottery, etc., but his descriptions suffer from the disadvantage of a complete absence of illustration.

If any one in virtue of knowledge and luminous criticism is capable of unravelling the history of the mysterious Hittites it is assuredly Dr. Hogarth, and he has combined the information brought to light, especially from Boghaz Keui, during the last twenty years, to use his own phrase, into a thin stream of history. In vol. **2** he treats of the Hittites of Asia Minor, in vol. **3** those of Syria. He distinguishes the Hittite race (*Hatti*) and Hittite Culture (a map shows the limits within which Hittite monuments have been found), and finally devotes a chapter to Hittite Civilization, which he considers to have been active for a period of 2000 years. But a good deal of research is still required before a thoroughly satisfactory historical narrative of this elusive people can be written even by the most capable hand. In a chapter on Hellenic Settlements in Asia Minor Dr. Hogarth writes on Greek Colonization and many interesting topics are discussed, *e.g.* the curious fact that the attractive and fertile coastlands of Ionia were colonized later than the more forbidding ones to the north and south; the difference between the first and secondary settlements in that the latter were true colonies, being formed for the benefit of the metropolis, whereas no such idea had actuated the earliest colonization of Asia Minor by the Greeks; and the influence of Asiatic Greece on European Culture. "The intellectual and artistic output of the Asiatic Hellenes in the sixth and seventh centuries," he remarks, "has so little counterpart in European Greece that typical European Humanism may justly be said to have been originally developed in cities in Asia." Greek colonization in the west is dealt with by Prof. J. L. Myres, who in a brilliant essay on the Colonial Expansion of Greece describes the origin and distribution of Greek Colonies throughout the Mediterranean, Propontis, and Euxine, and clearly shows how their life and prosperity were affected by

geographical conditions. Whilst, generally speaking, the uniformity of structure, climate, and natural products of the Mediterranean region favoured settlements, a forbidding seaboard in some parts, adverse climate in others, a harbourless coast or shoal-infested shore elsewhere, were detrimental to them. Compensation for a not too favourable situation is exemplified in the rich corn-growing soil north of the Euxine, and the wool-producing plateau steppe of Cyrenaica, these commodities being readily exchanged for oil and wine. Generally speaking the native population was friendly, though colonies near high ground were liable to be harried by the Highlanders, as in Paphlagonia and Thrace. Determined enemies were however encountered in the Phœnicians of Cyprus, Punic Africa, and Western Sicily, and in the Etruscans. A circumstance favourable to Greek colonization that has only recently been realized is the previous extension of late Minoan civilization (one of the many revelations due to modern archæological research) in the interval between the fall of Knossos and the irruption of alien peoples out of Central Europe in the thirteenth and fourteenth centuries. This interesting and stimulating historico-geographical study is illustrated by three maps on which the distribution of all the chief colonies are shown, and their metropolitan cities indicated. Another example of the contribution of archæological discovery to history is seen in the clear and informing chapter on Crete and Mycenæ by Mr. Wace. The subdivision of labour characterizing the compilation of this history is markedly shown in a short chapter on the Western Mediterranean in vol. 2, for it is written by three contributors. Prof. Peet writes on subjects he has made his own, Italy and Sicily; Dr. Ashby on Sardinia, Malta, and North Africa; and Mr. Leeds on Iberia. The last discusses the much-debated Dolmens, and makes out a case for his theory that they originated in Central Portugal.

Assyria, after a few pages of introduction in vol. 2 by Mr. Campbell Thompson, forms the leading subject of vol. 3, where Mr. Sidney Smith manages to give in some 130 pages an admirably lucid and readable account of the rise and fall of the Assyrian Empire, with an all-too-short chapter on Assyrian religion, administration, social life, law, literature, and art. After the fall of Nineveh the story is taken up by Mr. Thompson, and, the scene shifting to Harran and Babylon, he gives a sketch of the New Babylonian Empire down to the taking of Babylon by the Persians under Cyrus. In conclusion he adds a chapter on the Influence of Babylon as inferred from a study of Babylonian literature, astronomy, medicine, language, and law.

The Assyrians were not only great warriors, but also great artists, and judging from the two centuries of their dominion one of the boldest and most energetic people the world has ever known. This being so, the disappearance of the Assyrian people after the fall of Nineveh becomes one of the most remarkable facts in history—kings, dynasties, empires have often fallen, but the peoples have remained. But on the fall of the Assyrian Empire the Assyrian people disappear, and after centuries of almost overwhelming dominance they seem to have left no trace of influence on the history of succeeding ages.

The History of Egypt is resumed by Dr. Hall, under whose skilful and learned guidance we follow the decline of Egypt from the twenty-first dynasty downwards, and see the presence and influence of aliens—Libyans, Ethiopians, and finally the Assyrians, who under Ashur-banipal overwhelm the country and take and sack Thebes, a fate from which it never recovered. With Psammetikus, the *protégé* of Ashur-banipal, a new dynasty, the twenty-

sixth, arises, and Egypt enters on a period of restoration. Following the foundation of Naucratis there is increasing intercourse with the Greeks. Soon after his accession Amasis is saved from a Babylonian onslaught by the death of Nebuchadrezzar, and peace reigns in the land during his long rule. But after the fall of Babylon in 539 B.C. the Pharaoh has a new fear on him—the fear of the Persian. The year after his death the enemy appears, and his successor Psammetikus III. is completely defeated by Cambyses, who going to Sais ascends the throne of the Pharaohs as King of Egypt. Under the wiser rule of his son and successor Darius, the Persian dominion over Egypt was complete. From this stirring history of discord and war Dr. Hall turns to the peaceful world of Art, and in a chapter on the "Oriental Art of the Saite period" reviews the Art of Egypt, Phœnicia, and Assyria during this period. He discusses a number of most interesting points, such as the Decline of Art in Egypt from the twentieth dynasty, the new spirit of the twenty-fifth dynasty and its conscious archaism, revival of portraiture, and the meticulous care in cutting hieroglyphics and small figures in hollow relief. Of Phœnician Art, which often seems so elusive, he considers the most important character to be its conscious and careful eclecticism, with occasional reminiscences of Minoan Art, probably derived from Cyprus and Cilicia. The Assyrians were notable artists, witness the great relief sculptures of Nimrud, Kuyunjik and Khorsabad, and the bronze gates ot Balawat. The last suggests the interesting reflection, for which there are other analogies, whether the toreutic relief in bronze derived from Babylonia is not really the parent of the stone reliefs, and whether the school of Babylonian sculpture did not derive from the metal-workers.

E. A. P.

## GENERAL

**A History of the Greek and Roman World.— G. B. Grundy.** London: Methuen & Co. 1926. 9 × 5½, pp. viii. + 536. *Two Maps.* 22*s.* 6*d. net.*

The purpose of this work is to give a political and social survey of the Mediterranean nations from the Second Millennium B.C. to the second century A.D. As the Mediterranean is thus the connecting link throughout the centuries, some outline at least of its geographical factors might have been expected. Mr. Grundy, as many references show, does not ignore their constant influence, but he does not consider them collectively, apart from a few sentences at the beginning emphasizing the "isolation" of the Mediterranean region. This is not the usual point of view, and conflicts indeed with his own remarks on the contrasts between the Western "civilizations of intercourse" and the Eastern "civilizations of ease." The impetus to this intercourse, among the eastern Mediterranean lands at least, arose largely from geographical conditions which made existence hard and uncertain. The author emphasizes this, but is content to state, *e.g.*, that nowhere was the position more precarious than in Greece, and to leave it at that without further explanation. This economic pressure, as he shows, was responsible for the distribution of Hellenic colonies, and the importance of the Euxine and Egyptian granaries.

When this point of view has been set forth, there remains little more to be said here. Mr. Grundy writes vigorously and impartially: one of the interests of his work to the general reader is in the placing of recent developments in their correct setting; for example, the significance of Crete and the Minoan and Mycenean civilization for the Hellenic world is well brought out, and Herodotus is rehabilitated as a trustworthy guide.

**German Colonization Past and Future: The Truth about the German Colonies.**— **Dr. Heinrich Schnee,** late Governor of German East Africa; with Introduction by William Harbutt Dawson. London: George Allen & Unwin. 1926. 9 × 5½, pp. 176. *Illustrations.* 5*s. net.*

The writer of the long introduction "utters again the urgent warning which wisdom justifies and patriotism demands"; and so able a man as Dr. Schnee, assisted by a judicious selection from the writings of such wise patriots, has no difficulty in making a very good case from his point of view. A single phrase illustrates perfectly the tone of his argument. On 6 August 1914 German East Africa "was without any knowledge of Belgium's participation in hostilities." It is outside the scope of this *Journal* to deal at any length with a purely political book of this kind: but we may refer its readers to a weighty statement of the case for the other side, in the address on East Africa which General Smuts gave to a meeting of the Society on 28 January 1918 in memorable circumstances.

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# THE MONTHLY RECORD

## EUROPE

### Economic Position of Yugoslavia.

AN analysis of the economic position of Yugoslavia was contributed by Miss M. R. Shackleton to the *Scottish Geographical Magazine* for November 1925. For this purpose she divides the country into four main regions. The first, mainly consisting of Dalmatia, is the narrow coastal strip between the mountains and the Adriatic, enjoying a Mediterranean climate. The second is the mountainous Dinaric belt, karst and scrub region. To the east lies the largest area, still much broken physically, but formerly heavily forested. Its continental climate and relief favour mixed and fruit-farming. It has, however, several subdivisions; important ones are the fertile Šumadija tableland where maize and plums are grown, and the cultivated valley of Ljubljana. The fourth region (Vojvodina and Srem) consists of the fertile lowlands north of the Danube, and in the angle between the Danube and the Save, including a portion of the Banat. This is the richest agricultural area in Yugoslavia.

Economically, the country is predominantly agricultural: though at present only one-quarter of the acreage is under cultivation, in Vojvodina 80 per cent. could be utilized. This percentage falls to 15 for Dalmatia. The most important crops are cereals, particularly maize and wheat, the two forming about 20 per cent. of the exports. Sheep, cattle, and pigs are also largely raised, the first in the Dinaric mountains and Dalmatia, cattle in the third zone, and pigs in the cereal areas, *e.g.* Vojvodina and Šumadija. The cattle are chiefly exported to Italy. Fruit-growing is another important industry, especially plums which are dried and exported as prunes. Sixty per cent. of these are grown in North Serbia. Twice the amont of tobacco required for home consumption is grown in South Serbia in spite of official discouragement. After agriculture, the forests are important resources. Most are deciduous, but from Bosnia a considerable quantity of white fir and red and black pine is exported to Italy, Greece, and Hungary; also oak and tannin from Croatia-Slavonia. The

mineral resources are varied but not considerable in quantity. Three and a half million tons of coal, mostly brown coal and lignite, were produced in 1923. The chief field is in the Save valley in Slovenia, but the main resources lie around Sarajevo. Iron ore is also worked in Bosnia around Vareš and Ljubija, but the industry was only begun in 1917, and suffers from a lack of coking coal. Copper and lead are found in appreciable quantities, the former at the Bor and Majdanpek mines in north-east Serbia, the latter at Misica in Slovenia. In 1912, 7600 tons of copper were obtained at Bor alone, so that the present total production (6700 tons) could be greatly increased. Very few manufactured goods are exported, the production being insufficient for home consumption, and they are the chief item on the import list, which consists of cotton and woollen goods, hardware, machinery, etc. The imports are obtained fairly equally from Austria, Czechoslovakia, and Italy (which together send 60 per cent.), while 29 per cent. of the exports go to Italy, 24 to Austria. The chief needs of Yugoslavia are improved ports and communications. Three ports on the Adriatic are at present connected with the interior by rail: Sebenico and Spalato with Zagreb (and also through Bosnia to the Save valley), and Gravosa (Gruž) with the Sava and Danube lowlands. Other Adriatic ports capable of development are Cattaro and Baroš, part of Fiume harbour. Greece has also ceded to Yugoslavia a free zone at Salonika. The writer believes that the future of Yugoslavia depends upon the development of these ports and communications, but particularly upon the increase of agricultural production through the use of more scientific methods, the co-operative movement, and the replacement of the tendency of each farm to self-sufficiency by the growing of the most suitable crop.

**History of Settlement in East Prussia.**

A careful study of the history of settlement in the "Deutsche Oberland," on the western border of East Prussia, is given by Dr. W. Schulz in the *Mitteilungen* of the Königsberg Geographical Society, 1925. The Oberland is a product of the ice-age, being a northern spur of the Prussian lake-plateau. The surface varies considerably. The greater part was originally forest, and woodland is everywhere in evidence, but where this has been cleared the fertile loamy soil of the lower parts has well repaid cultivation, and even the lighter soils of the uplands are nowhere neglected. The district is everywhere well watered, and there are villages of fisher-folk on many of the numerous lakes. The climate too, intermediate between the boreal type and the moist temperate type of Western Europe, is not unfavourable on the whole. As a result there is a dense network of towns and villages which have been connected by roads from quite early times. In more recent times the Oberland canal has been an important factor in the economic development of the southern parts of the area. It is impossible to say what proportion of the surface was once forest, but only two areas of any extent appear to have been free for early settlement—round Prussian Holland and Saalfeld respectively. The many swamps now drained must formerly have been inimical to settlement. Yet the wide distribution of relics of the Stone Age shows that even then the Oberland was populated. Finds from the Bronze and Iron Ages have been but scanty, but those from Roman times are more numerous, especially around Prussian Holland and the southern lake-district. In later pre-Christian times the borders of lakes and rivers seem to have been specially chosen, and ease of defence seems to have been the main consideration.

The intrusion of the Prussians seems to have dated from the second century

A.D., the next important event being the invasion of the Teutonic Knights in the thirteenth century. The records of this order give some slight help in determining which were the early Prussian settlements. After the revolt against them had been put down, holdings were often leased to their former owners and the localization of the holding as in such and such a "campus" seems to indicate that the settlement was originally Prussian. Many German settlers were introduced by the Knights, and by the fourteenth century the region was already fairly well peopled, but it is difficult to gain any clear idea of the actual distribution of the settlements. In 1540 a definite picture is afforded by the Tax-register, which seems to show both a general decline of population (owing to the wars) and a change in its grouping, the greater part being concentrated on the lower ground, while more of the land was in the hands of the nobles. The condition in 1685 and 1785 can be judged from records of those dates, at each of which an advance is to be noted, the high-water mark being reached in the nineteenth century.

The early Prussians chose sites capable of defence whether on high or low ground, but the Germans thought rather of the needs of their herds and sought the neighbourhood of meadows, ponds, and streams. Having developed in the neighbourhood of the old forts, the towns show the influence of an original defensive position. In general German villages are both more populous and less compact than the Prussian, as more ground was allotted to them originally. They are also distinguished by the straight line of the main street.

## ASIA

### Colonel Kozlov's Mongolian Expedition.

From time to time brief notices have appeared in the Press concerning the progress of the Russian Expedition under Col. P. K. Kozlov, which has been exploring in Eastern Mongolia and the Gobi Desert, but up to the present no comprehensive report has been received. The expedition, organized by the Russian Geographical Society, set out in the summer of 1923, and in the following spring it was announced that it had discovered and excavated burial mounds of Chinese princes in the Urga mountains, approximately 70 miles north-east of Urga. These were found in difficult country overgrown with dense forests, and proved to be of great antiquity. About 40 feet below the mounds were wooden sarcophagi, containing human remains and also objects of art, costumes, etc., of great importance. These are said to display "Indian, Byzantine, and even Greek influences," and have been attributed to the second century B.C. Col. Kozlov also made extensive botanical and zoological collections in the mountains. In 1925 a part of the expedition proceeded through the Gobi Desert to the site of Karakhoto, which Col. Kozlov had discovered in 1909. The remainder, under the colonel, journeyed through the Khangai mountains and along the upper reaches of the Orkhon river. From the latest report it appears that in these mountains there were found, at a height of 9000 feet, the tombs of generations of San-Nain Khans, with traces of Buddhist decoration. In the intricate and difficult gorge of the Orkhon river, a cataract 70 feet high was discovered. On the way south to Karakhoto, within the confines of the Gobi Desert, fossil remains of prehistoric vertebrates were also found. A large number of Col. Kozlov's collections have been sent back to Russia.

## AFRICA

### Development of Northern Natal and Zululand.

In the *South African Geographical Journal* for December 1925, Mr. R. A. Rouillard discusses the possibilities of development of these hitherto somewhat neglected areas. East of the edge of the High Veld there is a broken and rugged belt of some 45 miles sloping fairly steeply to the Low Veld. This comprises the Lebombo and coastal plains, separated by the Lebombo range, rising as a rampart to the height of 3000 feet, with the Candover valley, 2 to 5 miles wide, separated from the Lebombo plain by the Rooirand Hills. In the High Veld there is a rainfall of 50 to 60 inches, but the soils are only fair in quality. In the broken belt the rainfall varies from 35 to 40 inches, but though the soils are better the nature of the surface is unfavourable to agriculture and the farms are mostly pastoral. In the Low Veld, especially in the Lebombo plain, the rainfall is uncertain, varying from 10 to 20 inches, but the soils are extremely fertile and deep, so that their potentialities would be great if use were made of the vast volumes of water now running to waste. The whole country is intersected by six large rivers, the largest, the Great Usutu, having an average flow of 600 cubic feet per second during the winter months. It is calculated that nearly 700,000 acres are available for irrigation by these rivers, and the crops that could be grown in this way would include Cotton, Tobacco, Citrus, Sugar-cane, Tropical fruit, and Lucerne, Cotton offering especially favourable prospects. Hitherto little or nothing has been done to develop these possibilities, but an irrigation scheme has been started on the Pongola river, and it is hoped that this will only be the first of a series. Coal-mining has made great strides in Northern Natal during the past sixteen years, the Vryheid district containing the largest reserves of higher-grade coal in South Africa, but the railway facilities are inadequate to cope with its movement, or with the increasing export of maize, sugar, etc. The railway question is closely connected with that of improved harbour facilities, and it is held that great benefits would accrue from the construction of a harbour at Sordwana (reported on as a feasible and not very costly undertaking) and the building of a railway thence to the Vryheid coalfields. Such a line would also be most advantageous to agriculture.

## AUSTRALASIA AND PACIFIC ISLANDS

### Hydro-electric power developments in New Zealand.

A detailed survey of the utilization of water-power in New Zealand, and approved plans for its extension, is given in a publication of the Public Works Department—'Hydro-electric Power Development in New Zealand,' by Mr. Lawrence Birks, Wellington, 1925. The favourable conditions for this development in New Zealand, "the Switzerland of the South," are evident. Water-power for mining purposes had been employed as early as 1852; a small public hydro-electric plant was installed at Reefton in 1887, and by 1904 the question was receiving such attention that a full investigation was made by the Government. The previous year, the future development of water-power had been vested in the Crown. Licences for the construction of works have been issued to twenty-six local authorities and several private companies. By 1910, however, the movement for the direct participation of the Government in power development was successful, and the Lake Coleridge scheme for the supply of Christchurch was initiated. Its capacity of 12,000

kw. is now insufficient, and is to be extended to 27,000 kw. Following on the success of this scheme, plans have been drawn up for inter-connected systems for both islands. The basis is the calculated demand per head of the population—$\frac{1}{5}$ h.p., that is 160,000 h.p. for the North Island, and 116,000 for the South Island. Three main stations are proposed for the North Island — Mangahao (nearing completion), Lake Waikaremoana, and the Arapuni Rapids on the Waikato River. These stations are ultimately to be connected by 1112 miles of 110,000 volt lines. The total cost was estimated in 1918 at a little over £7,300,000. Ten years is the probable period of construction. Allowing for expenditure and running costs, the power should cost £6 per h.p., and the scheme when running should save one million tons of coal per year. In the South Island, three schemes with a total capacity of 77,000 h.p. are being developed at Lake Coleridge, Waipori Falls, and Lake Monowai, while others are being investigated. The total expenditure on all schemes to March 1924 was over £3,000,000. In addition, two schemes are being carried out by Electric Power Boards, and three smaller schemes are under construction. The power thus supplied is being increasingly used in farming and dairy districts, is tending to check the "urban drift" of the population, and should stimulate the development of industrial areas.

## MATHEMATICAL AND PHYSICAL GEOGRAPHY

**Echo-Soundings in the Indian Ocean south of Java.**

At the request of Dr. C. Braak of the Batavia Observatory, and in fulfilment of suggestions made at the Pan-Pacific Congress of 1923, the Government of the Netherlands Indies has undertaken a series of echo-soundings in the Indian Ocean, and the results of the first operations have been published as No. 17 of the *Verhandelingen* of the above Observatory. They were made on board of four submarines and their depôt ship *Pelikaan* with the ordinary instruments used for communication between ships by sound-waves. Each determination of the interval between sound and echo was repeated several times, and the time-error thus reduced to about 0·1 sec. As the surface movements of the sea were found to exercise disturbing effects, the soundings were made either from the submarines when submerged, or by sinking the receiving apparatus to about ten metres below the surface. The values adopted for the velocity of sound in water were based on Maurer's figures, taking account of the variations due to temperature, depth, and salinity. In the paper above mentioned the results are tabulated and also embodied in a chart. This likewise records the results of earlier soundings, which agree fairly well with those obtained by the new method. Great variations in depth are shown to occur in the area in question, but the regular course of the isobaths confirms the trustworthiness of the observations. Parallel to the south coast of Java at a distance of about 150 nautical miles there is a deep depression with a maximum depth of over 7000 metres, a remarkable feature being the steepness of the slope by which the ocean floor falls to this depression from the north: for a distance of 20 km. it has gradient of one in six. South of the depression, and in a line with Christmas Island, there is a row of submarine elevations in about 71° S. A knowledge of the configuration of this part of the ocean floor is of much importance for the study of earthquakes in the Archipelago.

**Ancient Climates.**

In keeping with American interest in this subject the *Scientific Monthly* for May 1925 has a collection of articles treating of diverse aspects thereof by such well-known writers as Dr. W. J. Humphreys, Dr. T. W. Stanton, Dr. E. Antevs, Dr. D. White, Prof. A. P. Coleman, and Prof. S. S. Visher. Throughout, however, there appears to be an undercurrent of agreement that varying geographical conditions are capable of bringing about the great changes of climate to which the geological record bears witness. In other words, there is increasing recognition of the principle that the distribution and character of land, sea, and ice, which are really at the bottom of the complex climatic conditions of the present day, have only to be varied to give rise to corresponding changes of climate apart from any possible subsidiary astronomical causes. As no one has done more than Mr. C. E. P. Brooks in this country to place the geographical theory on a firm quantitative basis, it is surprising that none of the authors in question so much as refer to his name.

On palæontological evidence Dr. Stanton comes to the conclusion that in Mesozoic times the latitudinal zonation of climate was not so sharply defined as at present, though this feature is, of course, known to be greatly affected by conditions of continentality and glaciation. Prof. Coleman points out that the fact of there having been a Pre-Cambrian Ice Age indicates that the Earth must have completely cooled down before the earliest known rocks were formed. Emphasis is laid by Dr. White on the effect of the mountain-building and active diastrophism in Quaternary times, not yet complete, in producing abnormal climatic differentiation over the Earth's surface, which has served as an impetus to organic evolution. Finally, Prof. Visher supports the view of Ellsworth Huntington that variations of storminess in sympathy with variations in solar activity have been responsible for marked changes of climate through the ages. It is certainly probable that changes in the emission of solar energy, which is the *primum mobile* of the atmosphere, are reflected in variations of terrestrial storminess and so of climate; but it should be remembered that, according to the modern theory of the Polar Front, vigorous cyclonic activity is very fundamentally dependent upon highly differentiated geographical conditions. It is therefore evident that Prof. Visher's line of argument involves only part of the question in which there is likely to be a complicated interaction of cause and effect. Taken together the papers constitute an interesting synopsis of current teaching in palæoclimatology.

## GENERAL

**Australian Memorial to David Carnegie.**

A replica of the Brechin Cathedral memorial plaque to the late Hon. David Wynford Carnegie, brother of the Earl of Southesk, has been unveiled in St. George's Cathedral, Perth, Western Australia, by Sir William Campion, Governor of the State, others present including the Minister for Mines (Mr. M. F. Troy), Major-General Sir Talbot Hobbs, and the Mayor of Perth (Mr. J. T. Franklin). Archbisop Riley conducted a short service. His Excellency extolled Carnegie's qualities of heart and head, and passing on to his achievements as an explorer said the greatest of his expeditions started from Coolgardie and went through the Kimberley goldfields and the then practically unknown country to Hall's Creek in 1896–7. The journey occupied thirteen months, and the story of the hardships endured by the small party was almost an epic.

Other exploring parties had traversed the country from west to east, but Carnegie essayed to go from south to north, and although he was unable to find a good stock route or any mineral wealth in that area, he accomplished a very great, necessary, and useful task for the State in exploring something like 2000 miles of hitherto untraversed country. David Carnegie had a most lovable nature and was a real leader whom anybody would follow. He died serving his country in West Africa, killed by a poisoned arrow.

**A Rare Account of Cook's Last Voyage.**

Some attention has lately been called to a little-known German book, published at Mannheim in 1781, containing a narrative of the voyage round the world with Captain Cook by a German sailor, Heinrich Zimmermann, who took part in it as one of the crew of the *Discovery*. The book gave a plain unvarnished account of the events of the voyage, and has become excessively scarce, no copy, unfortunately, being in the Society's Library. The recent presentation of the book to the Provincial Museum at Victoria, B.C., has elicited the fact that a copy also exists in the Alexander Turnbull Library at Wellington, N.Z., and some interesting extracts therefrom, translated into English, were printed in the Wellington *Evening Post* of February 27 last. The narrative is of some value as supplementing other and better-known accounts (with which the author disclaims any thought of competing), *e.g.* in the details given respecting Cook's death. We notice that a highly priced copy of the book is included in a recent catalogue of Hiersemann of Leipzig.

**The Earliest Maps.**

At the recent anniversary meeting of the Royal Dutch Geographical Society Dr. F. C. Wieder gave a lecture on the origin of the oldest maps. He divided such maps into three categories: realistic (giving a more or less true representation of the actual facts), diagrammatic, and pictorial, and gave reasons for supposing that all three methods were employed from the earliest times. Ptolemy's maps were in the main realistic, but in one special feature—the closing of the Indian Ocean by a continuous land-mass to the south—they were not in accordance with fact, and the speaker suggested that this feature was taken from the earliest Arab maps, of the diagrammatic class, in which the coast of East Africa was carried far to the south of Asia. This view, he said, found support from the maps accompanying the manuscript of Istakhri at Leiden University, the prototype of which may have influenced Ptolemy. The third or pictorial class has its representative in the early centuries of our era in the map lately found on the Euphrates by Franz Cumont—one drawn in colours on parchment and pasted on to the shield of a Roman Soldier (see *La Géographie*, vol. 43, pp. 1–5). But there is evidence for a still earlier use of all three types. Specimens of the realistic exist in the well-known map of Nubian Gold Mines, drawn on an Egyptian papyrus of the fourteenth century B.C., and in a map of roads in Babylon engraved on clay tablets. A diagrammatic world-map of the ninth century B.C., engraved on a stone, also comes from Babylon, and is suggested as the prototype of the world-map of Istakhri, having probably its origin in South Arabia, which occupies the centre of the map. A very early pictorial map may be found in the representation on a vase, dug up in the northern Caucasus and dating from the second millennium B.C., of the owner's hunting-ground—a chain of mountains, with two rivers ending in a lake, the drinking-place of wild beasts. Lastly, on

an Egyptian sarcophagus of the first Empire there is a representation of the road taken by the dead to reach the Elysian Fields, which seems to be based on the real shape of the Nile valley and points to the existence at that date of a realistic map of Egypt. As involving the greatest difficulty to construct, the realistic map would at first be used for quite small areas; the pictorial for countries too large for personal survey; and the diagrammatic for representations of the whole world. The history of cartography is that of the conquests of the realistic map, through the country map to the world-map. It may perhaps be questioned whether we are justified in dividing the earliest maps into such hard-and-fast categories, for there would surely be intermediate stages due to the introduction, at all epochs, of hypothetical features into realistic maps. The paper is however suggestive and well deserves attention.

**Memorial to Members of the Canadian Arctic Expedition.**

A memorial tablet, prepared by the Historic Sites and Monuments Board, has been placed in the Dominion Archives building, Ottawa, to commemorate the sixteen men who lost their lives during the course of the Canadian Arctic Expedition, 1913–18. Eight were lost following upon the sinking of the *Karluk* in 1914: one party of four (three members of the scientific staff, Messrs. J. Murray, H. Bouchat, A. F. Mackay, the surgeon who had served with Shackleton, and S. Morris), failed to reach Wrangel Island; while four others, Messrs. A. Anderson, C. Barler, J. Brady, and F. Golightly, reached Herald Island, only to perish there. Three others died during the stay on Wrangel Island, Messrs. G. Malloch, of the Geological Survey of Canada, and B. Mamen, from scurvy, and G. Breddy from an accidental gunshot wound. Capt. P. Bernard, the master of the *Mary Sachs*, and a seaman, C. Thompson, lost their lives while crossing Banks Island in the winter of 1916–17. The graves of the remaining three, Messrs. A. Norem, D. W. Blue, and J. Jones, are on the north coast of Alaska, Baillie Island, and Victoria Island, North-West Territories.

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## MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1925–1926

**Anniversary General Meeting, 21 June 1926.**—The President, Dr. D. G. Hogarth, in the Chair.

The HONORARY SECRETARY (Mr. A. P. Maudslay) read the Minutes of the General Meeting held on 15 June 1925, which were confirmed and signed by the President.

In presenting the Medals and Awards the PRESIDENT said: The first of the Gold Medals, the Founder's Medal, has been awarded this year in recognition of the very distinguished leadership of the last, but we hope not the final, Mount Everest Expedition—an expedition which attempted the conquest of the highest mountain in the world. The Medal has also been awarded for the personal achievement of ascending higher than has been ascended by any other man who has lived to tell his tale. The Society congratulates the recipient

upon the high spirit and courage with which he attacked the mountain, and also upon the self-effacing temper in which he conducted the expedition to the verge of absolute success. Colonel Norton, with this award the first phase of the fight for Everest is over. If and when we are able to initiate another phase, we shall certainly call upon you. I have great pleasure in handing you this Medal.

Lieut.-Col. E. F. NORTON: I wish I were better able to express my sense of this very great honour. Although I feel that I owe it more to the performance of the splendid party, both British and Himalayans, which General Bruce handed over to me, than to anything I did myself, I still appreciate this great distinction more than I can say. I thank you with all my heart.

The PRESIDENT: The Patron's Medal, the other of our Gold Medals, has been awarded for very long and distinguished service to a geologist of the first rank who is now almost the *doyen* of his particular special science. To have made the first ascent of Mount Erebus and to have been a member of the first party that reached the Southern Magnetic Pole would have been enough distinction for any single man; but, as a matter of fact, other distinctions now in question are many and various and spread over something like half a century. Sir Edgeworth David, may I express my own personal pleasure in handing this Medal to a former member of the school of my own College and to an Honorary Fellow on the Foundation of William of Wykeham, for whom I also "am specially bound to pray"? It gives me great pleasure to hand this Medal to you.

Sir EDGEWORTH DAVID: I am deeply indebted to you, sir, for the kind words which you have spoken about me and to all present for the way in which they have welcomed me on this occasion. It is gratifying to be reminded, sir, of the extra bond of sympathy between us in addition to that love of geographical exploration. This honour that has been done to me is, I recognize, among the very greatest for which any geographer could possibly hope, and I am very grateful to the Council of the Royal Geographical Society for having seen its way to award this Medal to me. For three reasons one prizes this Medal specially. First, of course, because it is a Royal Medal awarded by assent of His Majesty the King. Secondly, because it is awarded by an ancient and honoured Society, in every way worthy of its title of "Royal," a Society which honours, helps, and inspires geographical effort in whatever part of the world it is made and by the countryman of whatever country, the sole qualification for honour being that that worker shall have brought light into places which before were dark. Thirdly, one prizes this Medal for the reason that it links one up with the great ones who have gone, men of hallowed memory like David Livingstone and many another. And such is the generosity of one's fellow-men, Mr. President, that I feel sure the living share with one in joy over this honour. It is surely an honour to the dear land of my adoption—Australia. I refer to Australia as a land, but it is rather an outlying part of our own Empire and a bit of ourselves. It was Australia who sent me forth on the two expeditions to which special reference has been made, the Antarctic Expedition with Sir Ernest Shackleton and that to Funafuti. The presentation of this Medal is an honour to Australia, but it is also an honour, I humbly trust, to all those in the Old Country who trained and taught me in early days and inspired me by their example. It also links one up to our own great explorers in Australia who won your Royal Medal, men like Strzelecki, Sturt, Leichhardt, Gregory, Warburton, Lord Forrest, and that truly great young explorer, Sir Douglas Mawson, a dear old student of mine in Sydney University

and the last recipient of your Patron's Medal; also a very worthy explorer in an outlying part of our Commonwealth, that of Papua, the Hon. M. Staniforth Smith. I value this Medal particularly, not only because it links one with worthy men of the past, but because, I trust, others of the present share the honour with one. For example, in that journey to the South Magnetic Pole area our magnetician Mawson surely shares the honour; also my other comrade, who afterwards perished in his zeal for exploration in North Polar waters, Dr. Alastair Mackay, late of the Royal Navy. Again, in the ascent of Mount Erebus, whilst I was the leader of the climbing party that was fortunate enough to be the first to ascend Mount Erebus, the supporting party was led by Lieut. Adams, who, as second-in-command of the whole expedition next to Shackleton, was really in charge of the whole party, so that this honour is shared by him. Lastly, in regard to the Shackleton Expedition, in matters of geology I share any credit with one whose ability in science and charm as a writer are only equalled by his generosity as a colleague, Raymond E. Priestley, of Cambridge. In the Funafuti Expedition, again, one shares any credit for that with Professor Sollas and his colleagues and my own co-workers, Woolnough, Sweet, and Poole. And I would say most earnestly, in conclusion, that any credit for that Funafuti Expedition I share with her who by her wonderful tact and sympathy and unfailing devotion to the many sick, both among the white people and among the natives, probably saved that expedition from failure, her to whom mostly I owe anything in my life's work, since first I knew her, that men may have accounted worthy, my dear wife, she who wrote 'Funafuti.' Dr. Hogarth, ladies and gentlemen, very humbly and dutifully and from my heart I thank you for this great honour.

The PRESIDENT: I next present the Victoria Medal, which your Council has awarded this year—and you know it is not necessarily awarded every year—to one who has stood for science in one of the most interesting countries of the world, one who has been connected long and honourably with the exploration of Egypt and, in particular, of its more remote, inaccessible, and difficult regions. It has not only been by his own expeditions and his own specialities that Dr. John Ball has advanced the knowledge of Egypt, but also by the invaluable help which he has given to numerous other explorers. Dr. John Ball, there would hardly be any one to whom the Society would award with greater pleasure this Medal given particularly for geographical science.

Dr. JOHN BALL: I beg the Council and the Society to accept my very sincere thanks for this award. In common, I think, with every other exploratory surveyor, I have found ample recompense for any exertions and privations of travel in the delight of mapping hitherto unexplored regions, and of contributing, in however small a measure, to the advancement of geographical science. I am almost overwhelmed at receiving the additional reward of so high a distinction for what, after all, amounts simply to having tried to do my job well. I prize your approval of my efforts more than I can say, and I deeply appreciate the very great honour which you have conferred upon me in awarding me this Medal.

The PRESIDENT: Your Council has decided to award the Murchison Grant to Mr. Frank Debenham of the University of Cambridge, not only for his scientific Antarctic work, nor, again, only because he is the first Director to be appointed to the new Scott Polar Research Institution which is to collect and coordinate the material which exists in this country for the benefit o future Polar expeditions, but because also he has taken a leading part in that development of geography in Cambridge as an educational subject in which

if you will allow an Oxford man to say so, the University of Cambridge has set the example to other Universities. Mr. Debenham, I have great pleasure in handing you the Murchison Grant, and in congratulating you upon your appointment as first Director of the Scott Polar Research Institution.

Mr. FRANK DEBENHAM: In these days when sciences overlap and when any expedition which succeeds must be composed of men who work together, no man's work stands by itself. In endeavouring to tell you my appreciation of the honour just conferred on me I take it as a tribute to my colleagues as well as to myself on that particular expedition. It is, in fact, a tribute to the work of all my colleagues but in particular of three men. For my work in the south was, in a manner, the reflection of that of three men. The first is Captain Scott himself, under whom I learned that adventure was, after all, but a minor part of what is commonly called the lure of the Polar regions; that there was much beyond adventure which interested one when there; and that it was the search after knowledge—what Scott was keener on than anything else—which really endured. The second man to whom I owed my inspiration and to whom this is a tribute as well as to me is Dr. Edward Adrian Wilson. He was an inspiration to the whole expedition, and any of our scientific work that has won merit in our reports or elsewhere has been largely due to the coordinating tact of Dr. Wilson. The third man to whom this award is, in a sense, also a tribute is present here to-day; he was my teacher, and my friend, at Sydney University. I refer to Professor Sir Edgeworth David, who not only taught me what I know of geology but inspired me to go ahead with it, and prompted me to attain my present position. I thank you with all my heart, sir, for this honour.

The PRESIDENT: The Back Grant has been given this year, as once before in the past, to an Indian Surveyor. Khan Sahib Afraz Gul Khan, who was the surveyor attached to Sir Aurel Stein, and who was recently in Hunza, is very well known. There is no body of men to whom geography owes more than to the native surveyors in India, and I therefore have very great pleasure in asking the Surveyor-General of India, Colonel-Commandant Tandy, to receive this award on behalf of his subordinate.

The Cuthbert Peek Grant, as you know, was designated by its founder especially for promotion of work which was actually in progress in the field. It can hardly be more than a moral encouragement where work is as arduous and as expensive as that which is in question at this moment, viz. the expedition which is being led by Major Kenneth Mason into the Himalaya. We have just had a cablegram from him, dated the 13th of June, eight days ago, saying that he had got over the first difficulties and fairly launched the expedition with complete success and that all and everybody were well. I hope that Major Mason will remember that this award carries with it the confidence and goodwill and good wishes of this Society. I will ask Mrs. Mason to receive the award on behalf of her husband.

Finally, we have the Gill Memorial which, owing to certain Stock Exchange matters in the past, has become the most valuable of these awards. There was, I think, no report made to us during the past session which equalled in dramatic as well as in scientific interest the account which was given us by Dr. Gordon Thompson of his remarkable and tragic journey with General Pereira across China. Dr. Thompson has devoted his life to the arduous and merciful work of medical missionary in that country. We trust that this award may be of some assistance to him in prosecuting that work. Dr. Gordon Thompson, I can assure you that if ever you are willing to come and tell us more about your work in China we shall be most glad to receive and hear you.

Dr. GORDON THOMPSON: I thank you very very warmly for this great and unexpected honour which you have done me, and you too, Mr. President, for the kind words which you have used in presenting the award. I would like to accept it, first of all, as a medical missionary who is not ashamed of his job. David Livingstone has been referred to, and some of us are proud to follow, in a very humble way it is true, in the footsteps of that wonderful and great pioneer. I thank you, then, as a medical missionary. And secondly, I would like to say that I take it that this honour which you have conferred upon me is not simply a recognition of a long and arduous journey along the borders of Tibet and Mongolia, but a tribute to the memory of that noble soul who lost his life during the journey, the late Brigadier-General George Pereira. And so as a tribute to him I would thank you once again for this honour. I would like to add that I propose to use this Gill Memorial grant towards the purchase of an ambulance car to help me in my work out in China. In this way you will be helping to send out to China a token of goodwill. Surely the Chinese people at this time need above all things else the goodwill of the European nations in all their distractions and difficulties, that they may realize we all wish them well, and that we medical missionaries are out there to help them in body and soul. I thank you, Mr. President.

The PRESIDENT then delivered his Anniversary Address, which is printed on p. 97.

Visitors having withdrawn in order that the Society might complete the business of the meeting, the President appointed Mr. E. P. Vacher and Major Hingston to be Scrutineers of the Ballot of the President and Council for the ensuing year.

The PRESIDENT: Whilst the ballot is proceeding, I beg formally to present to you the Annual Report of the Council which is in your hands. It is, of course, open to any member to comment upon it, but no resolution can be passed at this meeting.

The report was unanimously adopted, without discussion.

The Scrutineers having made their report, the PRESIDENT announced that the names proposed by the Council had been unanimously accepted by the Meeting (see List, p. ix).

On the motion of Brig.-General the Hon. C. G. BRUCE, seconded by Capt. T. L. EVANS, a hearty vote of thanks was accorded to the retiring members of the Council, and the proceedings terminated.

## THE ANNIVERSARY DINNER

The Anniversary Dinner of the Society was held at the Connaught Rooms on Monday, 21 June 1926.

The President, Dr. D. G. Hogarth, received the company, which included, as guests of the Society, the Rt. Hon. Sir Austen Chamberlain, Field-Marshal Viscount Allenby and Viscountess Allenby, Admiral of the Fleet Sir John M. De Robeck, Rt. Hon. H. A. L. Fisher, the Dean of Westminster, Sir Frederick and Lady Kenyon, the Vice-Chancellor of the University of London, the Rt. Hon. Sir Charles Eliot, General Sir William Furse, the Master of the Mercers' Company, Prof. and Mrs. H. Fairfield Osborn, and Mr. and Mrs. Alan Cobham.

After the loyal toasts had been honoured, the Rt. Hon. H. A. L. FISHER, in proposing the toast of "The Society," said: I have the great privilege of proposing to you the toast of the Royal Geographical Society, coupled with the name of its distinguished and far-travelled President. We all of us are

slaves of geography. Sooner or later every one of us experiences in his own person the advantages which a knowledge of geographical facts brings in its train and the penalties which attach to the disregard of them. It is the object of this illustrious Society to extend the boundaries of geographical science and to render geographical knowledge, in the widest sense which may be attached to that phrase, available for the use of the community at large. We are all of us aware that your Society equips and promotes expeditions of exploration and discovery into the farthest parts of the globe. We are aware that you provide lectures, and that the pages of the *Geographical Journal* contain learned articles upon a vast and, indeed, bewildering assembly of topics. All these things are familiar. What is less familiar, what is less spectacular, is the assistance which your Society renders to the student of geography through the use of your great library, the finest collection of geographical books in this country, through your maps and photographs, and through the systematic courses of instruction in cartography and in surveying which you supply to so many officers of His Majesty's services. In these ways you render a great service to the British Empire with its far-spread possessions. And may I add this, that of all societies yours seems to me to be by far the most fortunate, because there is not a human motive which the Royal Geographical Society does not successfully harness to its chariot. One man will serve you out of sheer restlessness. Another will serve you out of mere curiosity. A third will serve you from a physical passion for the high mountains. The bird lover and beast lover, the devotee of the ivory gull, the bird of paradise and the humming bird, the student of the earwig and the butterfly, the cartographer, the ethnologist, the geologist, all in their different ways, obey the impulse and own the sway of the Royal Geographical Society. Even politicians, base as they are often regarded to be, are not altogether immune from your allurements. I have known of diplomatists, trusting to the good nature of Sir Austen Chamberlain, whose presence we are so glad to welcome to-night, who have indulged in scientific vagaries and contributed their quota to the erection of the great temple of geographical science.

Your achievements have been tremendous. They are inscribed on every quarter of the globe. *Quæ regio in terrâ vostri non plena laboris?* One has only to read the pages of the *Geographical Journal* to realize how widely spread are the activities of this illustrious body. You explore the forests of the Amazon. You are familiar with the waters of the Rio Grande, and with the heights of the Sierra Nevada of Santa Marta in Colombia. If Mount Everest ever yields to the climber, I will venture to predict that the keys of that terrible fortress will be surrendered to a Fellow of the Royal Geographical Society.

Have you any doubts, have you any qualms, as to your future? I can only suggest that it may occur to some of you that all the great explorations have been made, that all the most dazzling achievements are in the past, and that in the future exploration will be less exciting and spectacular than it has been in the past. I am not certain that this is so. Great tasks still await your Society, and even if it be true that there are no longer large areas of the world's surface holding surprises for the meteorologist, for the botanist, for the geologist or for the cartographer, nevertheless there are surely vast regions on the Earth's crust which still await an intensive and scientific study. The world has very greatly contracted since those days when a thanksgiving service was held in London to celebrate the safe return of Queen Elizabeth from her perilous journey to Bristol! We have gone beyond those times. Nevertheless, if

there is ever to be a commercial air-route across the North Pole, I venture to suggest that the way to that consummation has been already engineered by the operations of the Oxford University Expedition to Spitsbergen which was recently undertaken under the auspices of your Society.

In the old days it was quite sufficient for a traveller to have robust health, a serviceable pair of eyes, and a sufficient supply of courage and determination to make substantial additions to our geographical knowledge. Those times have passed away. The traveller who would wish or hope to render a service to geographical science now must approach his task with a great panoply of knowledge. And here I have to render my humble tribute to the services which your Society has rendered to the cause of geographical education in this country and the help which you are giving to those who are equipping themselves for the task of geographical exploration as it must now be undertaken.

I have the pleasure of coupling with this toast the name of my old schoolfellow, Dr. Hogarth, whom I remember at Winchester as a formidable athlete. Dr. Hogarth is an athlete in more ways than one. What he does not know about the Near East and Arabia, I will not say is not worth knowing, but I will say is not known. I will also add that there is a great deal about Dr. Hogarth which is not generally known. In particular, I doubt whether the British public have any appreciation of the remarkable services which Dr. Hogarth rendered to this country during the Great War. He was then, I believe, a sailor, a member of Admiral de Robeck's profession. I do not know whether he would stand an examination from Admiral de Robeck, but he was a sailor and, if I may say so, the least marine of mariners. And in this amphibious capacity he did great things behind the scenes. It is not for me, in the presence of the Foreign Secretary, to divulge to you the precise nature of the services which the President of your Society rendered to his country. I will merely point out that in the surprising transformations which have come over the Near East, transformations greater than any which have been accomplished in that region of the world since the conquest of Alexander the Great, your President, himself the biographer of Philip and Alexander, has played no inconsiderable part. I beg to give you the toast of "The Royal Geographical Society," coupled with the name of its President, Dr. Hogarth.

The PRESIDENT, in responding, said: I have risen to my feet fairly often at these annual gatherings, and always hitherto with a certain pleasant sense of irresponsibility, which has probably been reflected in what I have said. But I can feel that sense no longer now that I stand before you, for the first time, as President. On previous occasions I have had to represent but 200 or so actual Fellows of the Society, men and women, who were collected in this room; and I have had the pleasant tasks—I do not know how they may be appearing to speakers who have to perform them to-night, but they seem to me, in retrospect, to have been pleasant and comparatively easy tasks—either of proposing the health of the Medallists, a task whose only embarrassment was to select among the varied and great distinctions of recipients of our honours, or of welcoming the guests of the evening, a task which always seems to me to perform itself, so great is the sympathy which is felt towards that toast by every one in the room except, perhaps, the gentlemen who are asked to respond! But it is quite another matter to stand up as your President and to feel that I represent not merely the 200 Fellows present in this room but the 6000 odd who fill the roll of this great Society. For, as learned societies go, it is a great and very numerous Society unusually representative of the cultivated public of the world.

I do not know how far you have realized the large proportion of Fellows that resides outside this kingdom. Whereas in other learned societies foreign members are generally restricted more or less to honorary, *i.e.* complimentary, members—this is true not of all societies but of most—in this Society something like 30 per cent. of the whole large total of 6000 odd permanently reside out of these islands. Of these about 1000 are in the Overseas Dominions—a fact which makes the Society in a very true sense an imperial mother Society—and about 700 live under foreign flags. It would be possible, for example, for a President of this Society to go to almost any considerable city in the civilized parts of the world and be greeted as a brother Fellow by actual Fellows of this Society resident in that country. That being so, we have, to a certain extent, to serve the needs of a world, and I am particularly grateful to the eloquent proposer of this toast for having laid emphasis upon duties in connection with research, performed by this Society, which are not quite so well known to the public as the service which it renders—less than we could wish—to the exploration of the globe.

Research has always seemed to me a primary function of this Society, as indeed of all geographical societies. We do perform it to a very considerable extent; that is to say, we give great facilities for its performance. But I am not quite sure that we yet do enough to organize, direct, and actually conduct it. I was a good deal impressed when I was in New York four years ago and in the house of that very live society, the American Geographical Society, by the organized research and study which were going on actually in the house. I should not be sorry to see our own fine house in Kensington Gore repeat in a modified form the scene which it presented in the first two years of the War, when it was the place in which the Admiralty handbooks were compiled, together with the well-known map on the scale of one million. Being the Director of a museum—and museums, if Sir Frederick Kenyon will allow me to say so, have a certain sepulchral character—I know nothing that makes a place of learning so alive as a number of real, earnest students working in it. I should like to see more of that kind of research resumed in our house. It will be the more necessary because what the proposer of the toast said about our having qualms in regard to our future is a fact. We have such qualms. It is quite true that the great pioneer journeys of the world have pretty nearly all been done; and that a network of pioneer routes has now been woven all round the globe. Nevertheless, within the wide meshes of that net there is still any amount of work to be done, and this is just the kind of limited intensive work for which previous education—previous research—is absolutely necessary. It is therefore important that the research side of our work should be developed before we pass into that second century of the existence which we began in 1830. In the new century I believe that intensive study of small areas will take the place of pioneer journeys over the face of the globe. For that we shall want not only education in research, but of course also more funds because it will not be the kind of work that will appeal to the generosity and imagination of the private giver as the great pioneer journeys of the past have done. Encouragement of research seems to me our main function in what I may call geographical education. A Society like this may well use its influence to induce the State to regard geography as a necessary element in education; but considering the other things that we have to do, it should not undertake actually to promote Primary, Secondary, or University geographical education. I am quite aware that in the past we have done something of the kind, particularly in regard to the Universities of Oxford and Cambridge. We did get geo-

graphical schools started there, and have sometimes been blamed for not having lent a helping hand to other Universities. We can only plead that what we did for Oxford and Cambridge strained our resources; and that it was more necessary for us to do it there than, say, in London, because of the peculiar constitution and character of the two old Universities, which if they are Universities there are no others in the world, and which if the others are Universities, then themselves are not so, so absolutely different are they. There are various features in the life of Oxford and Cambridge which make it difficult to move them in favour of a new subject; therefore it was necessary for the Royal Geographical Society as an outside body to assist the foundation of the geographical schools which are now such flourishing and admirable institutions in both.

Well, ladies and gentlemen, this is our 96th Anniversary, very near the date at which we shall reach our hundredth birthday. May I be allowed to say that, when we do reach that anniversary, I hope Admiral Sir Edmund Fremantle, who is here to-night and who recently celebrated his own 90th birthday—he is very nearly coeval with the Society—will again be present, having just celebrated a 94th! This 96th year I claim as one of great success, all the more remarkable because of the peculiar difficulties of the year, difficulties on which I dwelt, to some extent, in my Anniversary Address this afternoon. Some of them are peculiar to this Society, others are common to all inhabitants of these islands. I claim that success without the shadow of a blush, for whatever use a President of this Society may be, this President in particular cherishes no illusion that he is responsible for the success of a session; at any rate, it is not he who has to bear the brunt of its difficulties. I do not know how it may be in the great departments of State—I am not sufficiently behind their scenes—and all I will say is that in this Society it is the permanent staff that practically runs the show under its chiefs, Mr. Heawood, the librarian; Mr. Reeves, map curator and instructor; and, above all, Mr. Hinks, who since I had the privilege and honour of assisting in his election as Secretary some fourteen or fifteen years ago, in the days of Lord Curzon, has come to stand for geographical science not only in this country but throughout the world. Some time, perhaps next year, when I have had more experience of this chair, I may be moved to deliver a brief dissertation on Presidents as they seem to themselves and as they seem to other people. To-night I will only say that I find it extremely difficult to see how a President, gifted with any sense of humour whatever, can be a hero to himself, and I find it altogether impossible to understand how he could be a hero to the Secretary!

It has been a year of many a l remarkable geographical achievements, some of them promoted by this Society or connected with it; several conducted without its participation—for instance, the remarkable work of the German ship *Meteor* in the Southern Atlantic in carrying out those traverses backwards and forwards between Buenos Aires and the Falkland Islands on the one hand and the Cape on the other, in the process of which she discovered that there is at least one point at which the bottom of the ocean sinks as much below its surface as the peak of Everest rises above it, something like 30,000 feet being apparently the greatest depth. There have been two other expeditions about which we should like to know more, one conducted by a foreigner, another by a British subject, into which archæology enters. The one is Kosloff's expedition into Mongolia, which has evidently produced very remarkable and unexpected results, though so far the information received is too fragmentary for us to be sure what precisely they are. The other ex-

pedition is one of which something has been told in the daily papers within the last two months, namely, an expedition by Sir Aurel Stein, who is very well known to this Society. For some years he has believed that the great fortress of Aornos, which had to be carried by Alexander before he could enter India proper—that great fortress said to be situated on the Indus and to have had a flat top capable of supporting an army—would be found really on the Indus, and not where it has been located for the last sixty years. By the grace of the Indian Government he has been allowed to go into Swat territory, where he has found an isolated hill that he believes to be Aornos. We shall have the full account of his evidence in the *Geographical Journal*, and we devoutly hope that he has indeed settled a point which is extremely difficult to prove because of our uncertainty about the previous route by which Alexander approached India.

There are out in the field three expeditions at this moment with which the Society is connected. The one that has been longest away is that of Major Fawcett, from whom we have not heard since March 1925, when he was leaving civilization for the darkest and deepest part of the forests of Brazil. We cannot help feeling some anxiety about him, although he warned us that it was improbable that he would be able to get any news through to us until he actually came out himself. He has gone into a region which has never previously been penetrated, and which is known to be inhabited by cannibals of a peculiarly low type and peculiarly treacherous habits. An expedition is just about to depart to explore the eastern shores of Greenland, that frozen coast which gets no benefit of warm currents. The expedition is going to a region which was first discovered and explored by Englishmen, and it intends to repeat their observations and, in particular, to swing gravity pendulums where Sir Edward Sabine swung them one hundred years ago. This expedition is starting from Cambridge under Mr. Debenham and Mr. Wordie, and we have made various contributions to it. The third is the expedition towards which we gave the Cuthbert Peek Grant this afternoon. It has gone to an untrodden part of the Himalaya, led by Major Mason for the Indian Government. To that we have also made material contributions—particularly a very valuable new instrument.

May I say a word in favour of the newly founded Scott Institute of Polar Research in Cambridge, of which Mr. Debenham, who is here this evening, has been appointed the first Director? It is intended to perform a duty which it has long been desired that some one should perform: this is the gathering together and safe keeping of the records of previous Polar expeditions and examples of Polar equipment. Various financial contributions to it have been made, particularly by the Scott Memorial Fund; but there is not yet quite sufficient money either to build the necessary building or to maintain it when it is built. Still, with but little addition the necessary ends may be secured. I am sure the Society will wish all luck to Mr. Debenham as Director of the Institute.

This year has been different from some previous years—for example, the years of my predecessors—in that we have had no one big expedition in the field such as those which went forth to attack Mount Everest. Incidentally, such lack introduces some difficulty into the organization of our sessional programme. What we like—what the Secretary, in particular, likes—is to have a group of scientists newly returned from some great expedition, and to be able to call these up one after the other to the platform to speak to you. Failing that, we have always, to a certain extent, to whip up papers for the

evening meetings—we must go out into the highways and the hedges and compel explorers to come in. Explorers usually are shy folk. The type with which I am most familiar will brave any danger of Nature, of wild beast, and of wilder man, rather than the terrors of coming forward on the boards of the Æolian Hall and speaking to what is believed to be a hypercritical audience composed of you. There is, of course, another type, also very familiar—the pushing, self-advertising globe-trotter who goes far and wide in order to talk afterwards, and be talked about. He has, to a certain extent, to be discouraged where the others have to be approached and encouraged. It is among the varied functions of this Society to administer such encouragement and discouragement—*parcere subjectis et debellare superbos!*

I must not take up an undue amount of our precious time to-night. I have still to thank the proposer of this toast for the eloquent and sympathetic terms in which he proposed it. As he told you, he is a very old personal friend of mine. Our friendship goes back a great many years, for we are both older than possibly we look. But what is much more important is that he is, and always has been, a friend of everything which makes for intellectual progress in this country, one who has written his name, I believe indelibly, upon the history of our national education. Before he took to high administration—I will not say before he gave up to administration "what was meant for mankind," lest I should seem to cast a reflection on the high patriotic spirit in which he made a sacrifice at a period of national crisis—before he took to administration he had gone very far as a historian, quite far enough to have become, in some degree, a geographer. Therefore, whatever compliments he pays us, whatever sympathy he shows us, proceed, we know, from a real appreciation of our efforts and from knowledge of what falls to a great Society like this to perform. Mr. Fisher has expressed his sympathy, and we are grateful. We are not less grateful for the unexpressed sympathy which is testified by the presence of various other friends to-night, notably by that of the distinguished guest sitting on my left, His Majesty's Secretary for Foreign Affairs. But I must not deal with him, or with any of the other gentlemen whom I have in mind at this moment, for fear of encroaching on the province of the speaker who will presently propose the toast of "Our Guests." But may I, in definite conclusion, say one more word of thanks to the company at large for the very cordial reception which they have given to myself on the occasion of my first standing before you as your President.

Lieut.-Col. C. K. HOWARD-BURY: It is a pleasurable but, at the same time, a responsible task that I have to-night in proposing the health of "The Medallists," responsible in view of the necessity for briefness and the difficulty of selecting only a few of the most estimable qualities of our Medallists. We live in an age of self-depreciation. Pessimists are abroad in the land, and the morning papers are full of the moral or physical declension of our race and our nation. Well, when I look around to-night and see the faces of those who have done great deeds in the past and read the records of our Medallists, and when I see the anxious and eager faces of those who want to go out and emulate those deeds, I confess to no feeling of depression whatever.

In Sir Edgeworth David, who has been awarded the Patron's Medal, I think we have one whom we can regard as being among the leading scientific men of the great Australian continent. Sir Edgeworth David was in charge of that wonderful boring in the coral reef of the Funafuti atoll. The result of that boring has been to provide plenty of material for those who agree and for those who disagree with Darwin's theory of coral reefs. But in addition to

that, in 1907 he went out for a short coasting trip with Sir David Shackleton, and that coasting trip developed into two years of exploration. He left his University cares, his wife and his family, without a moment's thought, to devote himself to this great scientific expedition. He led the expedition that made the first ascent of Mount Erebus, and, in addition, he led the one and only expedition that has ever visited the South Magnetic Pole. Those achievements alone would be worthy of the granting of a medal to him; but in addition to that he has done a great service to the geography and the geology of Australia. At the beginning of the war he raised the Australian Mining Corps and soon became the leading geologist on the Western front. There he had a unique if, at the same time, extremely unpleasant experience, for when descending a well for the purpose of ascertaining the geological strata, the Germans perceived that something unusual was happening. They put a shell over which unfortunately smashed the pulley wheel, and Sir Edgeworth David made a very rapid descent to the bottom. Not content with that, they continued to shell the well for some hours, with the result that earth, stones, bricks, and all sorts of rubbish fell on top of Sir Edgeworth. It was not until many hours afterwards that he was rescued seriously wounded, but I think you will realize that he has suffered no evil effects from that very unpleasant experience. I think we may say, both for his service in the heights and in the depths, he has thoroughly earned the Patron's Medal.

The Founder's Medal goes to Colonel Norton, a name familiar to every one here. You all remember how General Bruce, through illness, had to give up the command of the 1924 Mount Everest Expedition, and Colonel Norton then took over command. That year especially it seemed as if the goddess of the mountain threw insuperable difficulties in the way of the ascent. She made use of all her forces, of icy blizzards and bitter winds, and a cold that penetrated everything. To the ordinary man these difficulties would have appeared insuperable, but Colonel Norton was determined to push on at all costs, and he achieved what I think we may call the record of having ascended to a height of 28,100 feet, and he has lived to return and tell you the tale. On his return, although suffering from snow-blindness—and I think few of you realize the intense agony of snow-blindness unless you have suffered it—under those agonies and also with the cruel anxiety of not knowing what had happened to his companions on the mountain, and under the terrible fatigues occasioned by that climb, he dictated those masterly dispatches which to this day stand out as a record of style and interest. I think the Founder's Medal has been well earned by Colonel Norton. And here again we have no cause for pessimism in regard to the declension of the British race.

The Victoria Medal goes to Dr. John Ball for his twenty-nine years of service in the Geological Survey of Egypt. Out of that survey he has developed a new branch of scientific geography, that of desert surveys. He started this during the war. It consists of a rapid determination of position in the desert by motor reconnaissance; and having once founded this new branch he has become Director and head of it in Egypt to-day. He has told us much, and yet much remains to be told by him of further motor reconnaissances and exploits in the desert; and his work in the development of the prismatic astrolabe with Mr. Knox-Shaw has thoroughly earned him, together with his scientific and geographical work in the deserts, the Victoria Medal.

The work of the others who received awards this afternoon has already been dealt with, but I feel sure those present would like to include them in the toast we drink to-night, especially the names of Major Kenneth Mason and

Afraz Gul Khan, who to-day should be nearing the Karakoram Pass in their great work of the survey of the Karakoram, which will prove of the greatest scientific value and benefit to this Society. I ask you to rise and to drink to the health of the Medallists of this Society.

Sir EDGEWORTH DAVID: In the first place, I wish very heartily to thank Colonel Howard-Bury for the extremely kind words in which he has spoken about me. I only wish I could feel that I deserve all he has said. He said I had gone out regardless of wife and family! I know he will forgive me for saying I really still have a regard for both. But, joking apart, I feel thrilled with the great honour that has been conferred upon me in the award of the Patron's Medal, and it is an honour to have the toast proposed by one who has won such high honours as has Colonel Howard-Bury. You, Mr. President, have referred to the unwillingness of explorers to speak on the platform of the Æolian Hall. Surely, if there is one place in the world that is likely to "put the wind up a man" it is when he is asked to speak in a hall devoted to the god of the winds! I had the wind put up me in that hall by a gentleman who, as the President has said, has won golden opinions from us all in the many years of his faithful service. He is eminent for astronomical research, and he is no less eminent for his services most unselfishly rendered to ourselves. Mr. Arthur Hinks is an astronomer and counts minutes and seconds. Before I spoke in the Æolian Hall this afternoon he said to me, "Four minutes and no more." I venture to think he is now watching me with a stop-watch in his hand!

The President has referred to the modern field of geographical exploration. It is very gratifying to see that the Royal Research Ship *Discovery*—a name so associated with that heroic sailor, Captain Scott, that one feels a specially vital interest in her future, the original of which was fitted out partly by the Royal Society, partly by the Royal Geographical Society—it is gratifying to see that that ship has now gone into the South Seas on a very important investigation into the big whaling interests, and also to practise that art which is going to do so much for our knowledge of the geography of the unknown parts of the seas, the method of taking soundings by echo. During the Pan-Pacific Science Congress in Sydney in 1923 Captain Asserson of the United States ship *Milwaukee*, adopting this British discovery of echo-sounding which has been brought to a high pitch of practical perfection by the United States, as indeed by this country, with the ship coming full speed all the way from San Francisco to Sydney, took continuous soundings, often crossing known soundings taken with the plumb line, and he found that the echo method was in very close agreement indeed. Therein lies great possibility for future knowledge of the conformation of the unknown areas of the ocean. But, since Wegener's hypothesis with regard to the floating of continents, the withdrawal of North and South America away from Africa and Europe is gaining ground so much, we ought to get borings down into the bottom of the sea. It can be done, and it must be done, and by British enterprise. It is simply an engineering proposition. It is possible to moor a ship even in the deep ocean, as has actually been done by Alexander Agassiz, and that should greatly facilitate such a boring.

The Warden of New College has pointed out that while the known areas of seas and lands are now so great that there is very little left for geographical exploration in the mere matter of discovery, it is the scientific side of geography that is making such wonderful strides at the present time. Surely the scientific side of geography is something like a lighthouse. The lighthouse is built up

to a certain height. It chases darkness from around the centre. We may find it out of date; we may build the lighthouse higher and stronger, and it chases darkness over an ever-widening periphery, but that only serves to widen to our view the infinity of darkness that lies beyond. Well, one cannot but apply to our Society, Mr. President, those words:

> "Wider still and wider, let thy bounds be set:
> God, who made thee mighty, make thee mightier yet."

In conclusion, I thank you for the great honour you have done me and for the manner in which you have received the toast.

Colonel E. F. NORTON also responded and said: I have small claims to being either a geographer or an explorer, and knowing as I do the great achievements of the notable men who in the past have won the Founder's Medal, I admit that I felt considerable diffidence when I heard that this great distinction was to be conferred on me. The all-too-kind speech in which Colonel Howard-Bury has proposed the health of "The Medallists" to-night has, to some extent, dispelled this diffidence, but it has left me wondering whether perhaps we of the Mount Everest Expedition of 1924 made rather too much of such risks and hardships as we encountered. Yet I would be the last to deny that the Expedition put up, to use a homely phrase, a good show. The performances of several of its members were such as to set a high standard for future expeditions, for many of their finest feats were performed by men who were really at the time sick men. Mallory, Irvine, Somervell, Hazard, and Beetham all gave fine exhibitions of that spirit. I was fortunate in being no worse than one usually is at those altitudes, which is a very poor thing, and so I do not include myself when I say that the performance of the party in face of unexpectedly severe weather conditions was a remarkable one. We cannot all have Founder's Medals, and if I may regard myself as the representative of a very fine party, then, and then only, I hope I need have no undue diffidence about my qualifications.

I should like to add a word as to the extent to which we in 1924 were indebted to our predecessors: to the very fine reconnaissance led by Colonel Howard-Bury which found the route to and the route up Mount Everest, from which we have only deviated in very minor respects in subsequent expeditions—considering that this reconnaissance was carried out under monsoon conditions, the results attained were most remarkable; to the organization of General Bruce and the very fine party that he handed over to me, imbued with what I might call the "Bruce spirit" of cheerful camaraderie, and comprising that wonderful band of Himalayan porters on whose shoulders we shall yet climb Mount Everest.

May I take this opportunity of paying a debt of gratitude I owe to a prominent Fellow and ex-President of this Society, himself a Founder's Medallist and the great driving power of successive Mount Everest expeditions? I mean, of course, Sir Francis Younghusband. Although he is not here to-night, I cannot miss this opportunity of paying a tribute which I owe him. On the eve of our departure in 1924, at a final meeting of the Mount Everest Committee, he expressed his confidence in me in terms which made me determined to deserve it. This was only an earnest of what his attitude was to be throughout the expedition. By every mail that reached us from home his letters arrived, proving to us that we had the fullest backing and support from him, and expressing, in most generous terms, his admiration of anything that we had accomplished. It was not so much the principle of supporting the men on the spot—we expected nothing else from Sir Francis Younghusband—that we

appreciated. It was the generous sympathy and understanding of our difficulties from one who himself had experienced similar conditions that heartened us up in a wonderful manner at a time when we were inclined to be disappointed at our lack of success. I shall be loth to rank myself with "those globe-trotters who require dissuading from standing on a public platform"; in conclusion, then, I will only say how deeply I appreciate the very signal honour that has been done me in awarding me the Founder's Medal. As a friend of mine wrote to me, in these piping times of peace it is the highest prize to which a man can aspire.

Dr. JOHN BALL: I should like to express my very hearty thanks for the kind words in which Colonel Howard-Bury has spoken of me and my work, and for the very kind reception which you have given to this toast.

I may remind you that this is the second occasion on which the Victoria Medal has been awarded by the Royal Geographical Society for survey-work in Egypt. The first occasion was about fifteen years ago, when it was given to my distinguished former chief, Colonel Lyons. A very great deal of what we have been able to accomplish in these latter years is based on the excellent foundations which were laid by Colonel Lyons; and speaking for myself, I have found that the experience which I gained while working under his direction has proved of the utmost value in subsequent endeavours.

There still remains a very considerable amount of surveying to be done in Egypt before completely satisfactory maps can be made of the whole of that country, or the full extent of the economic resources of its deserts made known. But I shall return to my labours with an added zest from your kindness; and I am sure I may say, on behalf of those who are now associated with me in the exploration of the deserts, that if anything can add to the enthusiasm with which they pursue their researches, it will be the interest which this great Society has so clearly shown in the work we are doing.

Lord RONALDSHAY, in proposing the toast of "The Guests," said: A banquet of the Royal Geographical Society is always honoured by many distinguished guests, but it seems to me—I may perhaps be prejudiced—that on this occasion we are even more highly honoured than we have been in the past, for there is scarcely a branch of human activity upon this planet which is not represented by one or more of its most distinguished figures. I have said "upon this planet," but with Mr. Alan Cobham sitting on my left I should perhaps have said "on and above this planet," for by his flights to India and back and to the Cape and back he has shown that he is capable of rising altogether superior to the ties which bind us ordinary mortals to the surface of the globe. With some little doubts as to the propriety of my doing so, I venture to offer him the congratulations of this Society upon his achievement. I said "with some little doubts as to the propriety" of doing so because it seems to me that Mr. Cobham is fast rendering obsolete much of the work in which we, as members of this Society, are chiefly interested. Indeed, if mankind at large were to acquire the same easy command of the air as Mr. Cobham, it is obvious that the old-fashioned traveller, and indeed the map-maker, would very soon become as extinct as the dinosaur whose eggs, I believe, were recently discovered in Mongolia as the result of the prescience of another of our guests, Prof. Fairfield Osborn. I do not know how Prof. Osborn knew that that group of mammals, which is known to scientists by the pleasant name of amblypods, used to besport themselves on the plains of Mongolia two million years ago. All I know is that he did know that they did, and in order to prove that he was right he visited Mongolia not long ago and brought

back in triumph from one of its sand-heaps the tooth of a choryphodon, which might be described, I suppose, as one of the last of the amblypods.

Science and the arts are indeed richly represented at our board to-night. London for this one night has spared to us the Director of the British Museum, Sir Frederic Kenyon, who must, I think, at one time or another, have been the President of more erudite societies than any other living man. And London has also spared to us the Vice-Chancellor of its University, Dr. Gardner, who has laid bare to the world so much of the history of ancient Greece by his archæological researches. And in Mr. Ray we have present amongst us the greatest living authority upon the languages of the Pacific Islands. Amongst the older of the Universities, Oxford has sent us to-night the Warden of one of its most eminent and famous colleges, Mr. Fisher; whilst in Sir Charles Eliot we have a representative of the newer Universities in Sheffield and Hong Kong. These two eminent representatives of the academic world have shown how easy it is for a really first-class brain to excel not merely in letters but in administration; ay, not merely in administration but in state-craft and diplomacy, for they have shown us that they are equally at home, the one of them in the cloisters of Oxford and the purlieus of Whitehall, the other in the senate house of the University and in the ambassadorial chair. And not far from me on my right I see a very reverend dean, by no means gloomy, whose recent hegira, if I may so describe it, from York to Westminster is undoubtedly a matter for lamentation in the northern capital, but is equally undoubtedly a cause of satisfaction here, for it will be responsible for him rising in a few moments to reply, in part at any rate, on behalf of the guests.

In General Sir William Furse we welcome the recently appointed Director of the Imperial Institute, and in Colonel Lane, the Master of one of those great mercantile city guilds which have played so large a part in the history of the British people. Of Sir Austen Chamberlain I perhaps need say nothing except this, that by his conduct of the affairs of this country in all parts of the world he adds daily to the load of gratitude which every citizen of the British Empire owes to him. How gladly would we have listened to him to-night! The riddle of why we are not to do so I am wholly unable to solve. Certainly it cannot be due to indolence, for he is the most industrious of men. At the same time he is the most retiring of men, and we must therefore presume, I suppose, that it is due to innate modesty.

In conclusion, I turn for a moment to the fighting services. I welcome, on your behalf, a breezy admiral and a gallant soldier and administrator. Admiral Sir John de Robeck well maintains the traditions of His Majesty's Navy, traditions of thoroughness in work and enthusiasm in play. As President of the M.C.C. he has proved that he is as much at home on the cricket pitch as he was on the quarter-deck of his ships when he commanded them in Gallipoli and, more recently, when he commanded the Atlantic Fleet. It is perhaps not so surprising, as at first sight it may seem to be, that he should be equally at home in these two very different spheres, for during the summers to which we in these happy islands have become enured, it is undoubtedly the fact that the cricket pitch is as often under water as the quarter-deck.

And then I turn to the other distinguished guest who, with the Very Reverend the Dean of Westminster, I couple with this toast, Field-Marshal Lord Allenby. A very gallant soldier who has so often led his troops to victory, who has conquered Palestine and has ruled Egypt, a man whose many honours—for he holds, amongst others, the Grand Cordon of the Striped Tiger of China, and of the White Eagle of Serbia, together with that of the

Redeemer of Greece and of the Rising Sun of Japan—bear eloquent testimony to the wide geographical distribution of his activities and his achievements. Ladies and gentlemen, I ask you to drink in all heartiness the health of our guests to-night, coupled with the name of Field-Marshal Lord Allenby and the Very Reverend the Dean of Westminster.

Viscount ALLENBY: The President said earlier that perhaps some of those privileged to speak later would feel it somewhat of a burden or be frightened. I am not frightened, but I am sorry for you who have to listen to me, because I am no speaker. I shall not keep you long, because I am going to be followed in my pleasant task of responding to the toast of "The Guests" by a very eloquent speaker indeed.

I came here to-night expecting to hear something about geography, and I have heard a good deal. I heard a little about it, when I was a child, from the lips of my governess. She used to tell me that Africa was a sandy desert; that India was a coral strand; that Greenland had icy mountains; and that Ceylon had a population that was vile. I have been to some of those places since and found that my governess was wrong! However, for a considerable portion of my life I did not know she was wrong, but of course you knew all your lives, although you may not have known her. Now she knows a good deal more because she has gone where she can know! But now it is easy enough for children to know the world, because the Royal Geographical Society has, by the brains, intelligence and industry of its members, sent out maps of the world which really can be trusted. The science of geography is an exact, a trustworthy science, except where it becomes complicated by political geography. There, naturally, it is very inexact. Compare a map of fifteen years ago with one of the same country to-day, of somewhere towards the East, especially the south-east of Europe, and you will find yourself very mixed up.

The Royal Geographical Society goes on working hard and surveying the surface of the globe, and it is now, as has been said to-night, assisted by the Air Force. Not only do they map the surface of the world from the crust of the Earth, but from the air. I know that very well, because I had the honour to command the troops in the Palestine campaign, and we worked then on the old map made by Lord Kitchener many years ago when he was a young officer of Engineers. That map, which was very accurate at the time it was made, was made absolutely accurate by the activities of our airmen, who by means of air-photographs altered and corrected that map till we had at the end of the campaign as good a map as any one could have. As witness to that I can call upon Colonel Meinertzhagen, who is here and who did such magnificent service in mapping the country and in applying that map to the incidents of the campaign.

I have been happy to know that the Royal Geographical Society is proceeding with those efforts; but I have been rather disturbed in mind to-night. I thought when I came here to-night that the science of geography was only concerned with the crust of the Earth. Now I find that it not only ascends to the heights of the mountains but goes to the depths of the sea. That is getting into too deep water altogether for me. I will conclude by thanking you, on my behalf, for the way in which you have responded to the toast of "The Guests," and I ask you to accept the expression of my admiration for the adventure, for the daring, of the geographers who have the mapping of the world in their hands. I shall not dare to descend into the depths or to ascend the heights to which they venture, but I know that whatever they do attempt they will carry through.

The DEAN OF WESTMINSTER: As I survey great congregations from the

pulpit I often wonder at the patience with which they listen to the whole of the sermon. Are you aware that to-night you have already listened to ten speeches? I think if I were to give notice that in the Abbey next Sunday morning there would be eleven sermons instead of one the audience would be thin. I am quite sure that as speech followed speech, especially as you listened to the last two speakers, your sympathy with me has been increasing. Therefore I speak with great comfort and confidence because I know I have your sympathy.

A great many years ago—Sir Frederic Kenyon could probably tell you how many, I believe five thousand—there was a book written which is probably one of the oldest of books and is now published. It contains the "instructions" of a certain important personage in Egypt to his son, who was going out into the world, somewhat as follows: "Owing to the position that I have won for you in society you will mix with many able men. You will at first be depressed because you will feel 'everybody is an expert' except thyself. But the good God is very fair in his gifts, and you will in time find that you also, like other men, have your gifts." I have been listening to speech after speech and considering some of the great things that the speeches meant, and I feel, as I am quite certain very many of my fellow-guests have felt, that everybody here is an expert except myself. I wondered whether, after all, Providence had been so good and whether anything had been left for me. However, Lord Allenby has told me what my gift is, though neither I nor anybody else has ever found it out before. I am an "eloquent speaker"! If practice makes for eloquence I have every right to the title. Some time ago one of our most distinguished and able counsel was examining a witness. He looked at the witness and observed that the central feature of his physiognomy was a brighter colour than the rest. And he said to the witness, "Answer me now: I think you take as much intoxicating liquor as is good for you?" The witness replied, "That is my business." "Yes," said counsel; "have you any other?" Owing to the unstinted hospitality of this great city I have dined at so many public dinners and made so many speeches of the kind that I am making now that I am beginning to wonder—and I know my friends are too—whether I have any other business.

Well, I have. I am here to-night to return thanks in the name of my fellow-guests, and I would hardly venture to voice the gratitude of those distinguished men whose names have been specifically mentioned. I speak rather in the name of the others, and there must be many here to-night, who feel, as a friend of mine once said in similar circumstances, they are nothing but "notorieties amongst celebrities." I have another business besides speaking at public dinners, and that is the reason, as I am well aware, why such great hospitality has been accorded to me during the last few months. I am in charge of the Abbey, and it is for the Abbey's sake that you are kind to me. I sometimes think that the Abbey represents the very converse, as it were, to that which is represented by the Royal Geographical Society. You push out into all parts of the world; with your expeditions and your scientific research you reach to the ends of the Earth. All parts of the world and the ends of the Earth come back to the Abbey.

My having come from York to London has been mentioned by Lord Ronaldshay, and it falls to few men to have the privilege of having the charge, first, of such a place as York Minster, and then of Westminster Abbey. I thank you for your hospitality in my own name: I thank you also in the name of all those other guests who are here to-night for what I know they feel, as I do—the honour as well as the great pleasure of having been allowed a share in your great gathering.

Map to illustrate the paper
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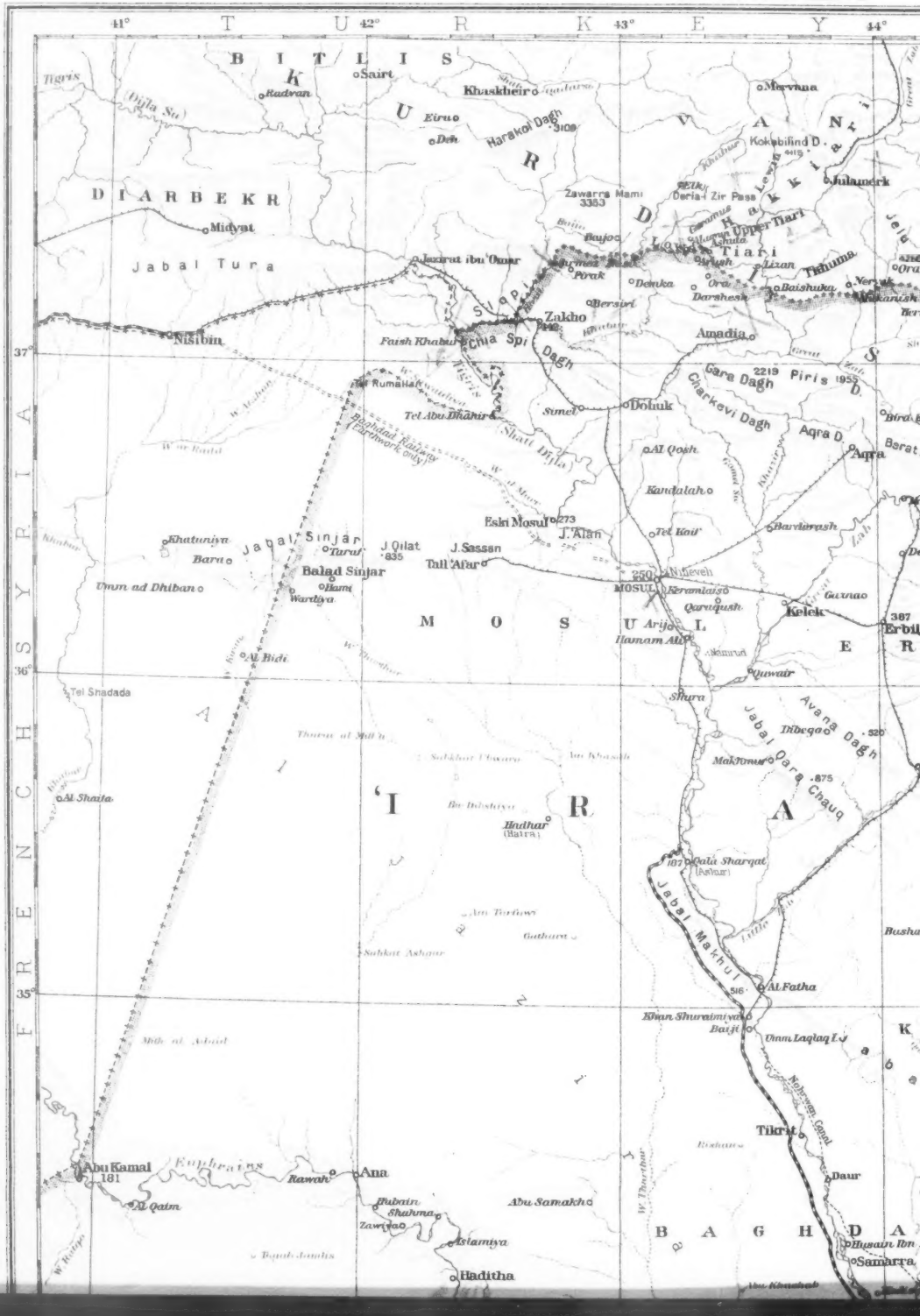
by
MAJOR H. I. LLOYD



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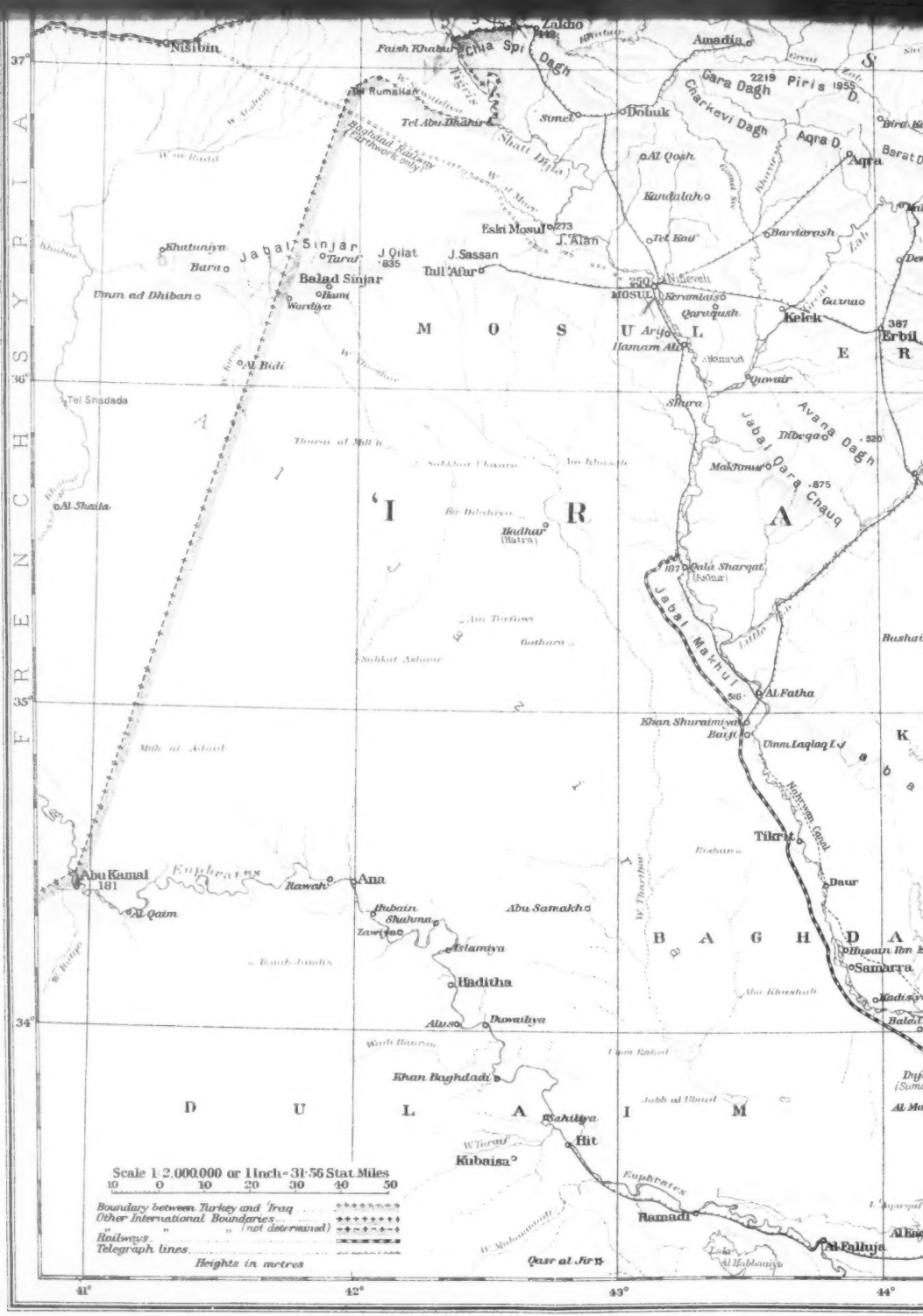


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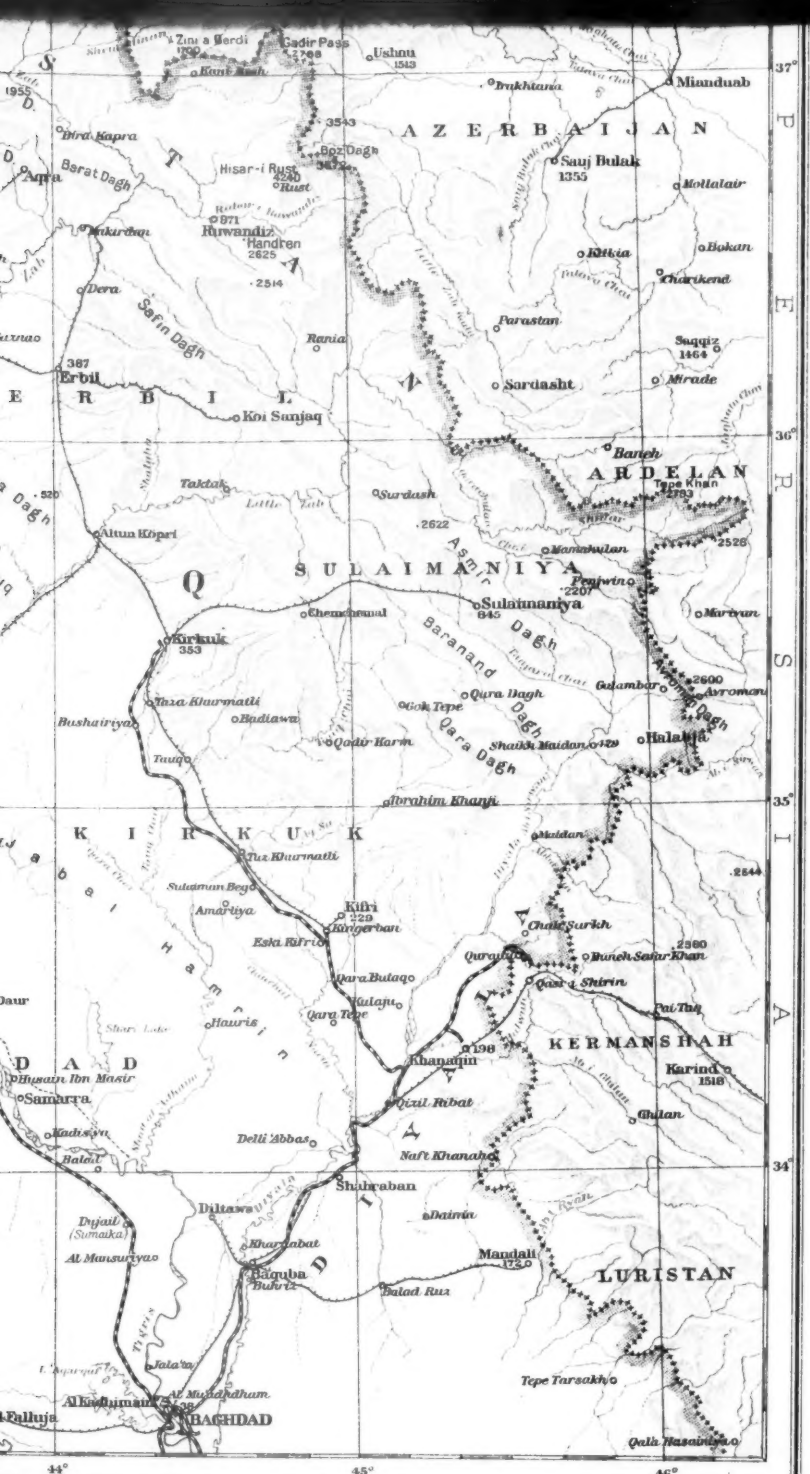


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